PUBLIC WORKS

CITY COUNTY STATE

Barrett Tarvia

GOOD ROADS at LOW COST

JUL 19 1933

No need for signs like this on a Tarvia road. Tarvia is lastingly skid-safe—dry weather or wet.

The Barrett Company

New York Chicago Philadelphia
St. Louis Minneapolis Boston
Detroit Cleveland Hartford
Buffalo Columbus Milwaukee
Providence Syracuse Birmingham
Lebanon Toledo Cincinnati
Baltimore Youngstown Bethlehem
Rochester Portland, Me.

THE BARRETT COMPANY, Ltd.
Montreal Toronto Winnipeg Vancouver

Ask the Tarvia field man, or write us, for a copy of the new Barrett Road Book containing tables and useful information about Tarvia and Tarvia-lithic.

Midland Trail, near Ashland, Kentucky. Tarvia-built, 1921.

THE development of modern, high-speed automobiles has made it necessary to build brakes and tires of great efficiency. But even the best brakes and tires are of doubtful value unless the road surface provides a firm treadhold.

With Tarvia it is easy to build roads that are lastingly skid-safe. No special method is necessary—in fact, it is practically impossible to build a Tarvia road that is not skid-safe. Tarvia penetrates deeply into the road crust, holding the stone or gravel firmly exposed on the road surface. The granular surface of a Tarvia road enables tires to grip the road effectually, even in the heaviest downpour, thus preventing skidding.

The Tarvia field man can demonstrate to you that it is just as easy, just as economical and just as quick to build skid-safe Tarvia roads as to build hazardous roads. 'Phone, wire or write our nearest office.

Liquid Chlorine

● An important feature of Mathieson's service to water works and to sewage plants is the rigid inspection applied to all Mathieson Chlorine container equipment before it is approved for shipment. ● Whether you order by single cylinders or by tank cars, every container is checked and rechecked to safeguard the purity of the product and insure all equipment arriving in perfect order. All valves, threads and other container parts must be clean, accurately placed and in efficient working condition. ● This careful attention to every detail is nothing more than you have a right to expect from one of the world's oldest and largest producers of chlorine.

• • •

Soda Ash...Liquid Chlorine...Bicarbonate of Soda...HTH and HTH-15...Caustic Soda... Bleaching Powder...Ammonia, Anhydrous and Aqua...PURITE (Fused Soda Ash)... Solid Carbon Dioxide

***The* MATHIESON ALKALI WORKS (*Inc.*), 250 PARK AVENUE, NEW YORK, N. Y.**

VOL. 64 No. 7
Entered as second-class matter at the Post Office at New York, N. Y., Sept. 1, 1922, under the Act of March 3, 1879.
Published Monthly by PUBLIC WORKS JOURNAL CORPORATION, 310 East 45th St., New York, N. Y.
JULY, 1933

COSTS LESS Installed

For the City of Cleveland, Ohio, at the Underground Exhibition Hall, this Armco Metal Crib-Wall serves to hold back the embankment. Insert at left shows bottom view of typical cribbing unit. Insert above shows relative size of cribbing units.

STRONGEST by Far

RETAINING WALLS OF ARMCO METAL CRIBBING

Wherever an artificially steep slope is needed—along streets, highways, railways and stream banks—for restricted right of way, grade separations, bridge abutments and wingwalls, bank protection and many other uses—here is where you need these modern retaining walls.

Retaining walls of Armco Metal Cribbing are a "gravity" wall, made up of a series of metal cribs or bins filled with earth, rock or other material. These cribs resist the overturning or pushing forces behind the wall. An Armco Metal Crib-Wall, possesses these distinct advantages:

1 It costs less because it requires no expensive foundation, is light in weight — one man can handle two units at a time—requires no expensive equipment, and it can be used immediately.

2 It is strongest by far. It is securely locked together and does not pull apart or break in unstable soils.

3 It is durable. It is made of the same rust-resisting Armco Ingot Iron which has a 27-year record in culvert service—under generally more severe conditions.

4 It has 100% salvage value. It can readily be moved, lengthened or increased in height.

Write for further details today. Armco engineers are prepared to help you with your retaining wall problems.

ARMCO CULVERT MFRS. ASSOCIATION
Middletown, Ohio

Gentlemen: ☐ Send more data on Armco Metal Cribbing. ☐ Show me the Armco Metal Cribbing Manual. I am interested in a crib wall approximately_____long by_____high.

Name_____

Address_____

Title_____ I am an ☐ Engineer ☐ Contractor ☐ Road Official ☐ Student.

P.W.-1

MAIL COUPON TODAY!

Table of Contents.....7; Industrial Literature.....51; Directory of Consulting Engineers .....47-48; Advertising Index.....54

The Wisconsin Road Builders have Developed Excellent Results with Their Highway Programs

THE State of Wisconsin has approximately 25,000 miles of the total of 81,000 miles of roads in the State and County systems which have been surfaced or paved.

This construction has been distributed to meet traffic requirements which are seasonal and local to the greatest advantage.

In 1932 over 2700 miles of road were paved, surfaced, or treated for dust with Standard Asphalt Road Oil or Stanolind Asphalt Products.

An inspection of the roads where these products have been used shows that they have accomplished the purpose for which they were intended in the most satisfactory manner.

STANDARD OIL COMPANY

(INDIANA)

119-C

910 South Michigan Avenue **Chicago, Illinois**

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54

FOR YOUR CONVENIENCE

Manufacturers of Sterling Transits and Levels

WARREN-KNIGHT CO.
136 N. 12th St.
Philadelphia, Pa.

Please send me your new 64 page illustrated catalogue of Warren-Knight Transits and Levels.

I am particularly interested in

☐ Transits
☐ Levels
☐ Transit-Levels
☐ Rebuilt Transits
☐ Rebuilt Levels

I am also interested in

☐ Instrument Repairs
☐ Rental of Instruments
☐ Equipment and Supplies
☐ WRICO Lettering Guides
☐ Electric Pencil for marking equipment

I am now using a ..... ☐ Transit, ☐ Level

Model No. ..... Serial No. .....

I would consider trading a ..... ☐ Transit ☐ Level for a new Warren-Knight

☐ Transit ☐ Level, Model No. .....

Name ..... Address .....

Position .....

STANDARD
SOCONY BRAND

ASPHALT PRODUCTS

Standard Cut-Back Surfacing Asphalt.
Standard Asphalt Binder A for surface treatment.
Standard Asphalt Binders B & C for penetration work (Asphalt Macadam).
Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete).
Standard Cold Patch Asphalt for all types of patching.
Standard Refined Asphalt for sheet asphalt paving.
Standard Asphalt Joint Fillers.
Standard Waterproofing Asphalt.
Specifications and all other particulars furnished on request.

SO SOCONY ASPHALTS AND ROAD OILS

STANDARD OIL COMPANY OF NEW YORK, INC.
A SOCONY-VACUUM COMPANY
26 Broadway

Road builders are CUTTING COSTS with the "77" MOTOR GRADER

on—

Ditching
Sub-grade *Building*
Oil Mixing
Graveling

"The best machine in my whole outfit," says one well-known road-builder.* Accuracy, high speed and large capacity make its economy outstanding.

The stability of the *new wide front axle*, the speed range of a *six-speed transmission*, and operation ease *from hydraulic controls*, combine to afford flexibility that has widened the work range of the Motor Grader to include a multiplicity of applications in road building as well as maintenance work. Write for information today.

The Austin-Western Road Machinery Co. Home Office: 400 N. Michigan Avenue, Chicago, Illinois. Branches in Principal Cities.

* Name on request.

Write for this cost data

The Austin-Western Road Machinery Co.
400 N. Michigan Ave., No. A5, Chicago, Ill.
Please send me complete information and cost data on the Motor Grader as road builder's equipment.

Name _____
Address _____
City _____ State _____

NO. 113A
Austin-Western

ROAD ROLLERS, CRUSHING & SCREENING PLANTS, SCARIFIERS, SWEEPERS & SPRINKLERS, ROAD GRADERS, ELEVATING GRADERS, MOTOR GRADERS, DRAGS, SHOVELS, CRANES, DRAGLINES, PILE DRIVERS, TRUCKS, DISTRIBUTORS, WAGONS, SNOW PLOWS.

PUBLIC WORKS

An Engineering and Construction Journal

City County State

VOL. 64 JULY, 1933 No. 7

TABLE OF CONTENTS FOR JULY, 1933

Editorial ....

Highways and Pavements:

Why We Need Engineering Supervision of Low Cost Roads. *By V. J. Brown* 9
Tar Surface Treatment of Low Cost Roads 13
Upper Darby Highway Work 18
Maintenance Equipment. *By C. N. Conner* 31
Grading Concrete Aggregates in Los Angeles 34
Record in Concrete Pavement Laying 34
Interest of Councilman in Contracting Partnership 38
Cement Bound Macadam Test Road 42
Spraying and Burning Roadside Growths 44
3,500 Miles of Traffic Strip Cost $163,000 44

Refuse:

Procedure in Contracting for Garbage Incinerators 43

Sewerage, Drainage and Sanitation:

Heating Top Sludge—II. *By Henry W. Taylor* 10
Estimating Flood Crest Run-Off. *By S. L. Moyer* 12
Spray for Killing House Flies 14
Pre-Aeration of Sewage by Air Diffusion for Grease Removal. *By Frank C. Roe* 15
Sewage Notes from Schenectady 38
Operation of a Small Sewage Treatment Plant. *By Floyd G. Browne* .. 39
Emergency Sanitation Following California Earthquake 41

Water Supply and Purification:

Corrosion of Water Mains and Services 16
Bacterial Changes in Chlorinated Filter Effluents. *By H. W. Streeter* .. 19
Aeration of Water Eliminates Taste and Odor 20
Water Coagulation with Ferric Chloride. *By Robert Newton Clark* 22
St. Paul's Successful Water Works 25
Operation of Columbus, O., Water Purification Plant 27
The WATER WHEEL 29
Safe Water from Wells and Concrete Reservoirs 32
Articulated Buttress Type Dams for Municipal Water Supply Projects. *By Dirk A. Dedel* 35
Building a New Reservoir for Los Angeles 42
Advantages of Diesel Engines for Pumping Stations 43

PUBLIC WORKS

J. T. MORRIS, *President*
W. A. HARDENBERGH, *Vice-Pres. & Asso. Editor*
CROXTON MORRIS, *Ass't Manager*

Founded in 1896
A. PRESCOTT FOLWELL, *Editor*
Published Monthly at 310 East 45th St. New York, N. Y.

SUMNER N. HUME, *New York, N. Y.*
JOSEPH E. O'CONNOR, *Chicago, Ill.*
Western Office: 154 E. Erie St. Chicago

SUBSCRIPTION RATES:

United States and Possessions, Mexico and Cuba $3.00
All other countries, $4.00. Single Copies, 35 cents each.

Brainstorms:

July 4th: Our latest addition to the roster of confirmed brainstorm addicts George H. Overing, kindly contributed this year's giant cracker (nut variety).

We claim to render a better service than the U. S. Department of Internal Revenue. Consider the case. You have only to solve the intricacies of the income tax form once a year (at least we hope you do) and if you succeed in getting the correct answer you pay the department, and if not, well, you still pay the department. BRAINSTORMS offers every man, woman and child, income recipient or not, a monthly opportunity to set down rows of figures for unscrambling, and there is no payment to be made, win or lose or draw. After that preamble we present Mr. Overing's excellent contribution.

The Farm Problem:

Five farmers about to dissolve partnership cannot come to mutual agreement on an acceptable method of dividing their flock of chickens. Though the total number is a multiple of 5, the idea that each take one-fifth of the number does not find favor. After much debate it is decided that the equities will be served if farmer A who has by far the larger interest, take one-fifth, farmer B who has the next larger interest one-fifth of the remainder, and so on for farmers C, D and E.

As it happened the division for farmer C could not be made to come out even until one of the chickens had been sacrificed to the dog, and when it came to allot farmer D his share, four of the chickens had to be sacrificed to the dog. The dog was terribly disappointed when the division for farmer E was effected without further sacrifice. While A and B were arguing hotly that the division was unfair because of the dog's having received five chickens which might have been divided among the five farmers, the other three farmers gave the remaining chickens to the hogs. Mr. Overing asks, "How many chickens did each farmer and the hogs get?"

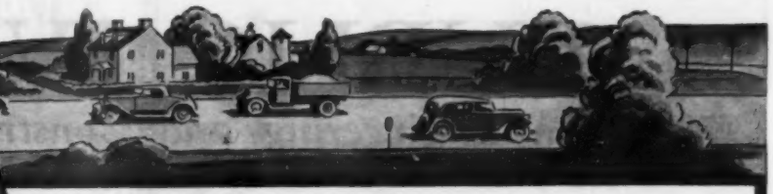
All Aboard:

Two excursion trains, one bound for the Chicago Fair and the other toward the city from which the first leaves, start at the same instant and meet 200 miles from Chicago. Both "lay over" for equal periods of time and on their return trips meet 300 miles from the other City. If the faster train maintains a speed of 30 miles per hour while travelling, how fast does the slower one go? There are no intermediate stops. All aboard! Let's go to the Fair.

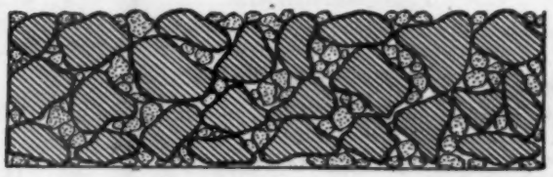
Solutions:

Now about Ikey, Mikey and Izzy. Izzy, the bicyclist did not average ten miles per hour for one hour as some might suppose. He met Mikey in 0.3888 hours after starting out, at which time Mikey and Ikey were 4.277 miles apart. The trip back to Ikey took Izzy 0.4953 hours. From this information we have a ratio of downhill time to uphill time which is applicable to the whole hour during which Izzy pedalled. He travelled 15 mph. for 44% of the time and 5 mph. for 56% of the time, thus covering about 9.4 miles.

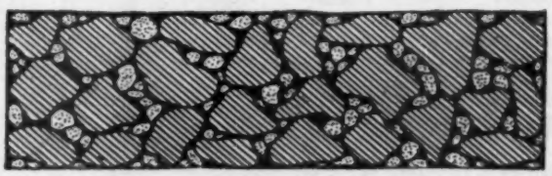
Ikey and Mikey were exploring the stratosphere 4.85 miles above sea level when their excursion came to grief. Late reports from the hospital indicate that both are doing as well as may be expected under the circumstances. You can't keep good men down very long and we expect them to pop up soon again. (Ed. Note: They have, already, see page 49).



1 *Gravel alone is hard, but it lacks cohesion, density and compactness.*



2 *Adding clay and silt cushions the large and small sizes, reduces disintegration and increases stability.*



3 *Moisture, attracted by Calcium Chloride, welds these elements together into a compact mass that makes roadway solid, smooth, dustless in any weather.*

Rx Soil Science prescribes— STABILIZATION FOR HIGH TYPE LOW-COST ROADS

WHAT IS A STABLE ROAD? FIRM ✓ SMOOTH ✓ DUSTLESS ✓

GRAVEL roads are stable when they are *moist*. Clay roads are stable when *dry*. But balanced composition of their soil fines when bonded with Calcium Chloride will provide *all-weather* stability.

Road Surface Stabilization affords hitherto unheard-of durability in traffic-bound roads. Use local labor and local soil to attain greatly improved roads. Bind the soil mortar firmly through moisture film cohesion with Calcium Chloride. You can reduce maintenance and resurfacing costs more than sufficient to cover the cost of the improvement. Let your road dollars build better roads at maintenance prices and extend benefits to all parts of your highway system. State, County and Municipal highway engineers everywhere are rapidly adopting stabilization principles in the development of improved type low-cost roads.

For further information about laboratory service for analysis and balancing of your local soil materials or about technical field service, write to any of the following members of the

CALCIUM CHLORIDE ASSOCIATION

MICHIGAN ALKALI COMPANY - - - 10 East 40th St., New York City
SOLVAY SALES CORPORATION - - - - 61 Broadway, New York City
THE DOW CHEMICAL COMPANY - - - - - - - Midland, Michigan
THE COLUMBIA ALKALI CORPORATION - - - - - Barberton, Ohio

CALCIUM CHLORIDE FOR COMPACTING ROAD SURFACES

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54

PUBLIC WORKS

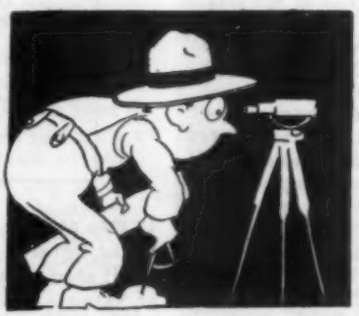
City, County and State Engineering and Construction

Vol. 64 *July, 1933* No. 7

Why We Need Engineering Supervision of Low-Cost Roads

By V. J. Brown

Co-Author "Low-Cost Roads and Bridges"



TWO years ago I talked with the engineer of a certain county in Illinois concerning his proposed black-top highway program for that year. He said that all he expected to do in this respect was to lay short stretches of one-half to three-fourths of a mile each in six different places in the county. He termed them "experimental" stretches. Both tar and asphalt binders were to be used, the product of different manufacturers, of course. He said he would not prepare specifications, but would use for each strip of road the methods recommended by the manufacturer whose product was used.

Despite the fact that it was of no real consequence to me, I ventured the suggestion that sections so laid could not be comparable, and that the proposed method would not provide sound engineering practice. However, he carried out his plan, with the result that two of the sections failed before the end of the first year of service.

Such an experience should not discredit the materials used. The construction of a successful project of any type demands proper engineering supervision, good design and satisfactory grades and types of materials. The failure of these two sections naturally caused dissatisfaction among the taxpayers and unfounded criticism of the materials used. As a result, these manufacturers were on the receiving end of a destructive and unfair "whispering campaign."

Granting proper drainage of the roadbed, there are three other important points in low-cost road construction: Quality of aggregate; engineering design; and supervision of construction. It is most unfair to class as unsatisfactory those materials which meet standard specifications but sometimes fail to stand up under such "experimental" installations as the one mentioned.

However, the manufacturers of such products cannot be entirely absolved from blame or criticism, even though their products do meet standard specifications. If they are eager enough to sell materials to be used experimentally, they should be still more eager to place a competent engineer on that job to see that it is properly constructed in every detail.

Cases such as that mentioned hinder low-cost road progress. Building a low-cost road requires a high degree of engineering skill and knowledge, even though the construction cost is small. Building a low-cost road is more than mixing a load of this aggregate with a certain gallonage of that binder, and spreading the resulting mixture on the subgrade. In fact, it is even more than mixing a properly graded aggregate with the proper amount of the correct grade of bituminous material using proper methods and equipment.

The inevitable result of the method of road building described in the first paragraph is friction, misunderstanding and disappointment, to say nothing of the loss of business on the part of the company supplying materials, and frequently the loss of prestige on the part of the engineer, as well as a certain monetary loss to the county.

The engineer for another county in Illinois received a large amount of unfavorable criticism because he tried to please his taxpayers at the expense of good engineering. In this case, too, the materials were satisfactory; the manipulation of materials, and the quantities of binder and aggregate were correct. But in endeavoring to stretch the road too far, sufficient supporting value was not provided. The road failed and had to be scarified and rebuilt.

There is such a thing as building low-cost roads at too low a cost. Since this error was made, this engineer has constructed several miles of excellent roads at low cost. But the old mistake is still charged against him by taxpayers, though this engineer, to my own knowledge, on one road alone, by the application of newer engineering methods, saved his county twice the salary he is paid annually.

These cases are quoted to show that the engineer must pursue diligently engineering methods. One mistake or oversight will offset many excellently engineered jobs. We should promote low-cost road progress by attention to *all* the details of engineering design and supervision. Therefore, as an engineer, biased only on the side of low-cost road progress, let me urge that every job, no matter how small, be given competent and diligent engineering supervision. Let it be handled in an engineering fashion.

Heating Top Sludge. II.

By Henry W. Taylor

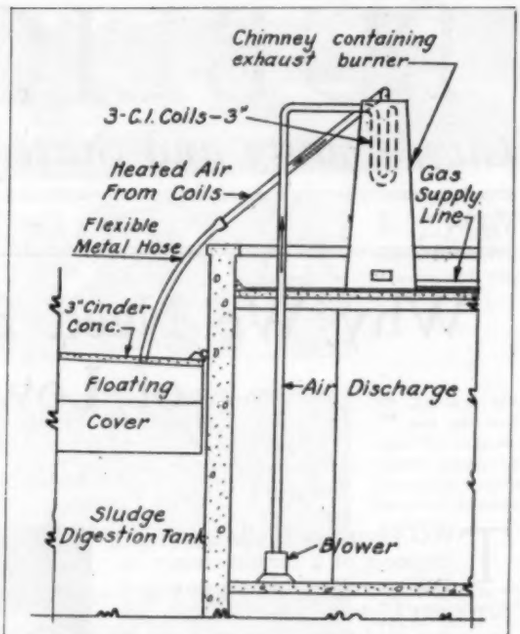
To Produce a More Uniform Rate of Digestion in Heated Digestion Tanks

IN THE April issue, an article with the same caption described the variation in sludge digestion in a heated digestion tank in the colder climates. Operating data from a separate sludge digestion plant at Saranac Lake, New York, was presented in graph and table form and indicated a striking seasonal variation in gas production. It was also apparent that there were two other variables working in parallel with the gas yield variation, while the table showed little variability in other factors which might affect the gas production rate. The graph illustrated the seasonal variations in terms of monthly averages and also showed these same variations in daily operation subsequent to December first, 1932. Outdoor temperatures apparently affect the top sludge temperatures through the cover and the chilled top sludge becomes inactive at lower temperatures and reacts on the gas yield. The top sludge contains a certain percentage of the total potentiality for gas yield and when this source of gas is depreciated by chill, the total gas yield is sharply curtailed, as a matter both of seasonal and of daily variation. The experimental conclusion was drawn that a means must be supplied whereby the chilling of the top sludge could be prevented. The first article described the method used to blow air through coils around the exhaust burner and to deliver this heated air to the attic space in the Downes cover which floats on top of the top sludge. This layer of hot air, between the top sludge and the outdoor cold weather, prevents heat losses through the cover and provides an active agent for heating the top sludge. The first graph illustrated the effect of the method of heating on the top sludge temperature, which began to rise from an initial level of 56 degrees to over 72 degrees. It also demonstrated the fact that when extreme cold weather was too much for the crude heating apparatus, the top sludge temperatures were depressed and the gas yield followed the same downward course.

Further Results from Saranac Lake

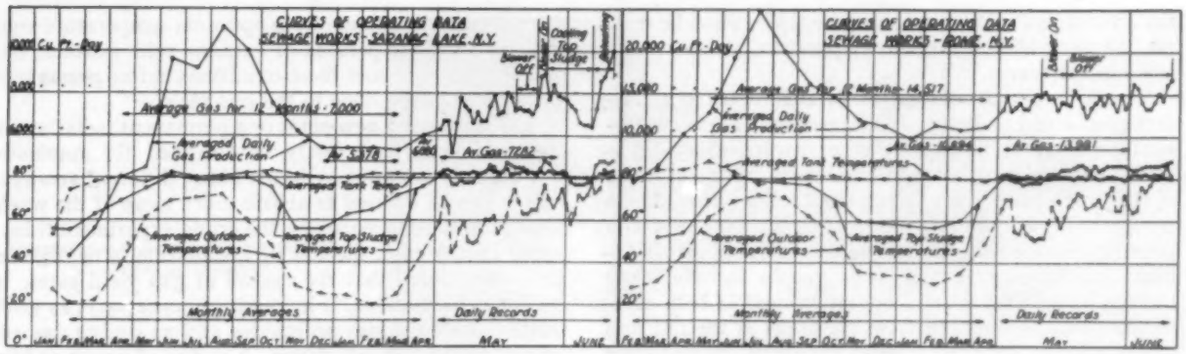
A NEW GRAPH has been prepared, showing the operating data at both the Saranac Lake plant and that at Rome, New York, each being plotted on a monthly basis up to May first, 1933, and on a daily basis thereafter. In the case of the Saranac Lake plant, this graph omits the early experimental periods which served to dictate the necessary apparatus and adjustments at the burner. During the latter part of March and the month of April, the temperature laws were interfered with by other factors and these conditions had to be rectified before the curves again took on their temperature significance. The top sludge which had been accumulating since last October needed a thorough wetting and the pH suffered a sudden drop. These conditions were rectified prior to May sixth.

It will be noted that the new graph, showing the months of December to April on a monthly rather than a daily basis, indicates an increase in top sludge temperatures, and only a moderate increase in gas yield.



Part section of control house, showing air heating equipment only

It was at first estimated that the critical temperature in the top sludge would prove to be about 77 degrees, but it seems apparent that 80 to 82 degrees are required at Saranac Lake to start activity in the top sludge. It will be noted that the top sludge temperatures now ignore the swings of the outdoor temperatures except when the blower is shut down. Due to the lack of automatic control, the top sludge temperatures reached excessive degrees and when cooling off, lower temperatures than desired would be reached. However, during the first twenty-nine days of May, the gas yield averaged 7,282 cubic feet per day as against an average of 5,378 cubic feet per day for the months of December to March inclusive, and 6,080 for the month of April. The average top sludge temperature for these days in May was 82.4 degrees as against the lower temperatures in the other periods mentioned. On May fourth, a dip in the gas curve was due to the removal of the dome cover for inspection as well as to the fact the blower was not in operation. From May fourth to ninth, the top sludge temperatures were not forced, but on the tenth of May, an effort was made to maintain the top sludge at a temperature of above 82 degrees. As shown on the graph, the gas yield on the ninth of May was 6,600 cubic feet and a saw-tooth progression in yield was produced extending to 8,900 cubic feet on the twenty-sixth. Drawing of sludge on the eighteenth had its usual effect of disturbing gas yield temporarily, and the progression is expectedly irregular for many other reasons, but a pronounced change in trend was produced. It was then decided to attempt a reverse trend, in spite of the warm weather, by cooling the top sludge. This chilling was accomplished by blowing the cool air of the evening and night into the cover attic. It will be noted that the effect on the top sludge temperatures gradually registered on the top sludge thermometer and there occurred a sharp change of trend in the gas yield curve. From the peak of 8,900 cubic feet per day on May 26, the gas yield



Curves of operating data of sewage works at Saranac Lake, N. Y., and Rome, N. Y.

was reduced to 6,400 cubic feet on the sixth of June. As it was desired to again change the trend of the gas curve, delivery of hot air to the cover attic was started on June 6 and the top sludge temperatures immediately responded and the gas yield curve experienced a sudden rise, culminating on the eleventh of June with a gas yield of 10,000 cubic feet. As these changes of trend, namely, the rise to May 26, the drop to June 6, and the rise to June 11, were accomplished in such a short period and under constant conditions of other factors affecting gas yield, it is considered that the top sludge temperature relation to gas yield is reasonably established. There would seem to be a range of control of gas yield demonstrated even under unfavorable weather conditions which can be used to advantage in connection with the ultilization of gas for heat and power. The summer peaks can be held in control and the winter deficiencies can be supplemented by this regulation of top sludge temperatures.

An inspection of the digestion tank was made on the twelfth of June and it was found that the condition of the top sludge had radically changed from the former conditions noted in the winter months and in April and early May. The consistency, color and activity of the top sludge were most encouraging. It is suspected, however, that the Bristol thermometer, which records the top sludge temperatures, has been reading too high, as suggested by the graph, and an accurate check of this thermometer will be made in a few days and will probably show that the readings have been about 5 degrees high. The same condition will no doubt be found at the plant. [The check showed readings high —Ed.]

Experiments at Rome, New York

Preliminary experiments were made at the separate sludge digestion plant at Rome, New York, in December, 1932. The work was discontinued to await the results at Saranac Lake, where the need was the greater, with the idea of gaining the benefit of the Saranac experience. In March, 1933, a Connersville blower was installed at Rome, with three-inch cast-iron Universal pipe coils, dropped into a chimney which houses one of the exhaust burners. The blower is operated at the rate of from 90 to 120 cubic feet per minute, and the coils contain about twenty lineal feet of piping exposed to the heat from the exhaust burner. The accompanying diagram shows the general arrangement of the apparatus. The data from the Rome plant are shown on the right hand side of the graph and it will be noted that the general characteristics of the various curves are similar in the case of both plants. The Rome gas curve is more uniform than the Saranac curve for the reason that the Saranac digestion tank was starved in June, 1932, to retard activity and reduce foaming. (In order to keep the graph within limits, the Rome gas curve is plotted at a smaller scale than

Table of Partial Operating Data, Sewage Works, Rome, N. Y.

Period	Av. Daily Kwh. Pumping Station	Av. Daily Fresh Sludge Cu. Ft.	Av. pH.	Av. Temperatures: Mean Outdoor	Mean Top Sludge	Mean Sludge Tank	Av. Cu. Ft. Daily Gas	Cu. Ft. Sludge Removal Total	Av. Temp. Cover Attic	Cu. Ft. Heated Air CFM.	Av. Daily BTU. To Tank Millions
Dec. '31	554	971	...	32	60	..	.....	.....	..	..	4.35
Jan. '32	578	696	7.2	34	..	75	2,485	.....	..	..	4.17
Feb.	574	720	7.3	28	..	79	4,456	.....	..	..	2.9
Mar.	525	750	7.5	31	52	84	6,480	.....	..	..	3.1
Apr.	608	795	7.4	43	54	84	10,160	6,720	..	..	4.38
May	455	801	7.4	61	69	88	12,693	11,168	..	..	3.85
June	405	838	*7.7	69	81	83	19,236	23,355	..	..	1.76
July	403	919	*7.8	72	79	77	24,840	22,109	..	..	1.5
Aug.	386	1021	*7.8	71	78	79	20,035	14,946	..	..	1.07
Sept.	375	939	7.4	62	77	81	16,146	11,940	..	..	1.57
Oct.	459	1042	7.1	54	68	81	14,771	10,410	..	..	1.87
Nov.	483	819	7.2	36	60	80	12,015	1,595	..	..	1.7
Dec. '32	459	819	7.2	34	59	80	11,287	2,247	38	..	2.0
Jan. '33	470	893	7.1	34	58	80	9,797	3,335	..	..	2.65
Feb.	468	865	7.1	30	57	81	11,355	1,812	..	..	2.92
Mar.	511	824	7.1	35	60	80	10,871	1,585	48	90	2.2
Apr.	553	815	7.0	49	72	79	11,160	7,600	60	90	2.2
May	458	794	7.0	64	83	81	13,981	8,625	..	90	1.7

*Field readings—probably high.

the Saranac gas curve and separate scales must be used for the gas yield, while the temperature scales are the same in both cases.)

The tributary population at Saranac is taken at 11,000 people and at Rome, 27,000 people. For a twelve-month period at Saranac, the per capita gas yield is 0.64 cubic feet per day, while the same figure at Rome is 0.54. Neither plant is equipped with gas baffles to deflect the gas rising near the walls of the tanks to a point under the cover and some considerable loss is experienced for this reason. The graphs include many months of the first year of operation, and in both cases top sludge was removed from the tanks in the fall and transferred to the storage tanks for secondary unheated digestion and concentration without gas collection. The increase in gas yield as the top sludge temperatures increased has been stated in the case of Saranac Lake, and it will be noted that at Rome, the gas yield during the first twenty-six days of May averaged 14,005 cubic feet per day as against the average of 10,700 cubic feet per day for the period from December first to May first. The Table indicates, as in the case of Saranac Lake, no striking variables other than the gas yield, outdoor temperatures and top sludge temperatures. The discussion of the matter contained in the first article and applied to Saranac Lake will not be repeated here, although it is equally applicable. The temperature conditions at Saranac Lake are more severe than those at Rome, not only as a matter of monthly averages, but also as to severe fluctuations and extremely cold nights which seriously affect the top sludge.

After the installation of top sludge heating apparatus at Rome, a rise took place in the top sludge temperatures and the 78 degree point was reached in the latter part of April. The blower was then shut off and the action of the gas yield noted. On May tenth, the blower was again put in operation and an effort made to maintain the top sludge temperatures above 82 degrees. The blower was shut off again on May sixteenth and top sludge temperatures maintained themselves above 82 degrees without assistance. In the case of the Rome tank, no effort was made to force the gas yield, but it was raised from the ten thousand rate up to the average for a twelve month period, namely 14,000 cubic feet per day, in the twenty-six days of May shown on the graph. Use of the blower during the summer will be made, using air without heat, to prevent excessive gas yields and in the fall hot air will be used to prevent a sharp reduction in gas yield as the cold weather approaches.

Future Operation

It is considered that top sludge temperature control is primarily a method of maintaining optimum conditions for digestive activity in all parts of the digestion tank. The work now being done is a matter of correcting faulty conditions of long standing. In the fall, the blowers will be used to prevent chilling of top sludge and to maintain desirable conditions and forestall those which occurred last fall and winter.

At both plants, the blowers will be used when necessary to maintain top sludge temperatures conducive to activity in digestion. For the next four months this use will probably be negligible, but in October the use of the blowers will be resumed before the top sludge starts to chill. The blower will be used to deliver cool air to the attic of the cover, in case of foaming or undue digestive activity which it is desired to control. In the dead of winter at both plants, the present crude apparatus will fail to maintain optimum temperature conditions for short periods of extreme cold weather, but it will quickly restore these conditions before permanent damage has been done to the gas yield.

In the case of a new plant or a permanent installation, this equipment can easily be designed for automatic control on a temperature basis. Many different arrangements can be devised to absorb much more of the waste heat than is intercepted by the crude experimental layouts. In any case, the cost of installation is negligible. It is considered that the control of gas yield rates, in so far as practicable, is increasingly necessary, as utilization of sludge gas progresses and as sludge gas engines are coming into favor. A source of power or heat can not be used economically unless fairly dependable. The operation of these two plants will be watched with a view toward maintaining a uniform gas production throughout the year, with the hope of encouraging the present tendency toward utilization of sludge gas for useful work.

Acknowledgment is made of the co-operation of the city engineer's office of Rome, including J. J. Gawkins, city engineer, William Kernan and Mr. Flood, who are in direct charge of the plant, together with that of manufacturers of the equipment used—the Pacific Flush-Tank Company, Pittsburgh Equitable Meter Company and the Connersville Blower Company.

Estimating Flood Crest Run-Off

By S. L. Moyer

In PUBLIC WORKS for October 1932, under the above title, the writer presented a formula for calculating probable flood crest run-off for areas of different sizes. his formula was

$$Q = (C1 - D)A,$$

and formulas were given for calculating values of C and D to fit different conditions.

Since then an analysis has been made of the most ample volume of run-off data so far available for a small area, which fills in a gap in the information previously available. This analysis suggests the wisdom of revising the formulas for C and D given in the article referred to, substituting the following:

Under 1700 acres $$C = \frac{0.63}{A^{0.042}} \quad (9)$$

1700 to 10,300 acres $$C = \frac{43.5}{A^{0.615}} \quad (10)$$

Over 10,300 acres $$C = \frac{0.192}{A^{0.025}} \quad (11)$$

For the Dayton-flood type of storm

Under 2000 acres $$C = \frac{0.94}{A^{0.0056}} \quad (12)$$

Over 2000 acres $$C = \frac{1.04}{A^{0.02}} \quad (13)$$

The deduction factor (D) is apparently not materially affected by the difference between sandy and clay subsoils and for some unknown reasons varies between

$$D = \frac{0.53}{A^{0.19}} \quad (14)$$

$$D = \frac{0.22}{A^{0.373}} \quad (15)$$

The data referred to were obtained on an area of 1940 acres tributary to Ralston Creek, Iowa. They were contributed by Floyd A. Nagler, professor of hydraulic engineering at the University of Iowa.

A sand-gravel base ready for surface treatment application.

Tar Surface Treatment of Low-Cost Roads

THE Bureau of Public Roads and representatives of the tar industry recently cooperated in making a field and laboratory study, in North Carolina, of surface-treated roads on which tar had been used. A report of this study has been prepared by the Bureau, to which we are indebted for permission to publish an abstract of same and for the photographs used to illustrate it.

The particular type of treatment investigated consisted essentially of the application of a light tar prime coat to the untreated road or prepared base, followed by a second application of tar with a cover of mineral aggregate; a third application of tar, called the seal, being applied with a mineral aggregate cover after the surface had been subjected to traffic for a few months. This treatment is designed to provide a wear-resisting surface which will adequately protect the base from deterioration and can be maintained economically in a satisfactory condition.

Approximately 1200 miles of this form of treatment have been built in North Carolina on many different kinds of bases with varying subgrade conditions. A detailed study was made of nineteen projects, which included inspection to determine the appearance, condition and riding qualities of the surface, and samples were taken of bituminous mat, base and subgrade representing typical conditions, and subjected to laboratory analysis.

As a result of this survey the following conclusions seem warranted:

1. Surface treatment provides a satisfactory low-cost wearing surface on several types of base.

2. Surface treatment has the advantage over the thicker surface mats in that it is more pliable and can, therefore, adjust itself to the movement on a flexible base with a minimum amount of cracking.

3. New roads or base construction should be subjected to traffic for some time before being surface treated, in order to produce adequate compaction and to determine the suitability of the base for surface treatment. Compaction under traffic is valuable as a means of detecting an excess of plasticity in the base, a condition which should be corrected.

4. In order to avoid failures in surface treatments resulting from unstable bases, research should be directed toward finding a means of reducing the plastic properties of the clay present, particularly in the natural soils.

5. A priming application is desirable as a final preparation of the base, not only to stabilize and waterproof the top but also to insure a bond between the base and the surface mat.

6. Tar of light consistency, because of its excellent penetrating and binding properties, makes a very satisfactory prime or stabilizing material.

7. Hot application tars are more satisfactory for the second application; medium and heavy cold application tars have many advantages in seal and re-treatment work.

8. A tough aggregate should be used as cover material in order to reduce crushing under traffic to a minimum so that the original texture of the surface and the stability of the mat may be retained.

9. Very fine sand or roadside material should not be used for blotting purposes because it has a tendency to produce either a brittle or an unstable surface.

10. A seal application is highly desirable as the final step in insuring a dense and waterproof surface.

11. Cold application tar is preferable to hot application tar in re-treatment work because it permits dragging and blading of the cover stone to produce a smoother surface. The finished road shows less tendency to bleed and is likely to retain its original texture for a longer time.

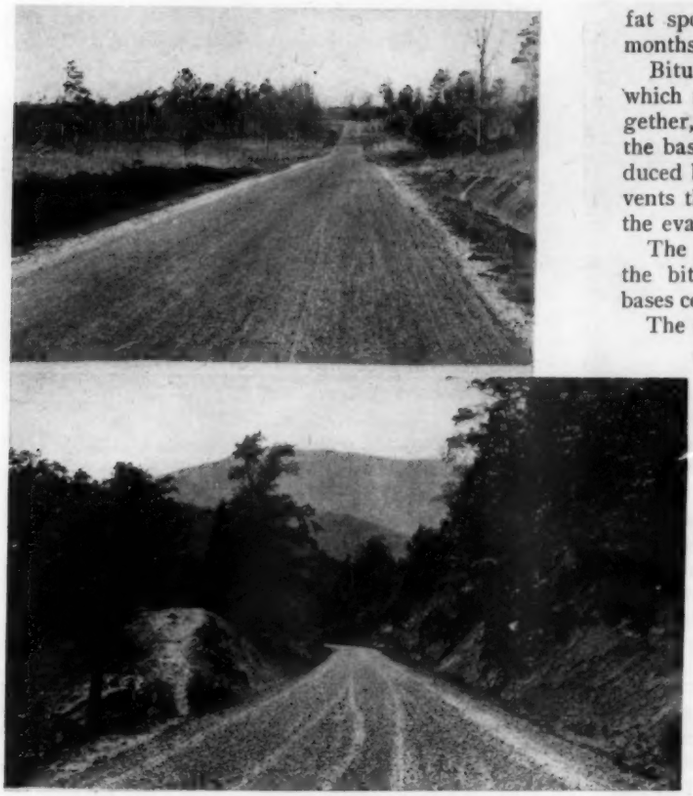
12. The principal requirement of bases for surface treatment is that they shall neither soften nor undergo appreciable change in volume with current changes of climatic or ground moisture conditions.

13. Soil tests serve to disclose those characteristics of the base material which materially affect the performance of surface treatments. In this connection the mechanical analysis is of assistance but by itself is not adequate for distinguishing good from poor base materials.

14. Determining the suitability of base soils according to their physical characteristics instead of by rule of thumb methods may show that the natural road soil, either alone or in some combination with other local soils, will serve as well or better than the more expensive base materials of recognized value.

15. A content of clay binder as low as 5 per cent has proved satisfactory in surface-treated bases. However, clays with capillary and cohesive properties as high as those of average or "statistical" soils and shrinkage properties considerably lower, may not prove detrimental in base mixtures even when present in amounts as great as 20 per cent. More than 10 per cent of highly plastic clay and all cases of highly micaceous material should be regarded with suspicion.

16. Some method of correcting unsatisfactory base material may often prove desirable. Fine sand is used satisfactorily



Top: A tar surface-treated road in North Carolina. Below: Loose aggregate bladed uniformly and ready for application of primer.

as an admixture to reduce clay content. Coarse material has not much value for this purpose and may be used to better advantage as a top course. The best method and material to use in stabilizing a soil will depend upon the character of the particular soil or base material. Often a thin top course of suitable material will increase the stability of the base sufficiently. In other cases, it may be advantageous to use a tar primer or to mix tar into the base.

Preparation of the base is very important. It should be or be made sufficiently thick, and given a compact, smooth, uniform surface free from dust.

The prime coat is an initial application of tar having low viscosity, for the purpose of hardening and moisture-proofing the top of the existing road, producing a dust-free surface to which the subsequent application of more viscous tars will adhere readily.

For the second application a more viscous tar is used, the function of which is to combine with the mineral aggregate cover to produce a thin, well bonded tar mat which will adhere to the primed base and provide a wear-resistant and waterproof surface. Hot tar gives better results than cold, its greater viscosity preventing its penetration into the base and therefore providing a thicker film to hold the cover stone. Also its greater adhesiveness adds immediate stability to the surface so that little cover material is lost. It gives a more resilient surface than cold application material.

For seal treatment and re-treatments essentially the same materials are used. Cold application is better than hot tar because a more uniform texture of surface is obtained, and the cover aggregate can readily be dragged to give a smooth surface. Also cold application tars coat the cover material with a thinner film, which tends to reduce subsequent bleeding and formation of fat spots. The seal was added from three to fifteen months after the original treatment.

Bituminous surface treatments provide (*a*) cohesion which serves to bind the top particles of the base together, (*b*) a mat which resists abrasion and protects the base from the suction, thrust, or other shocks produced by traffic, and (*c*) an impervious top which prevents the entrance of surface water into the base and the evaporation of capillary moisture from the base.

The wear-resistant mat and the cohesive action of the bituminous surface treatment are beneficial for bases comprised of all groups of soils.

The cost of surface treatment, exclusive of the seal, on the projects studied ranged from about $1,500 to $2,700 per mile of 18-foot width, depending largely upon the availability of materials. Patrol maintenance cost from about $200 to $300 per mile per year, and seal and re-treatments from about $1,050 to $1,250 per mile.

The type of failure occurring most frequently on the projects was a cracking of the mat, usually confined to small local areas. This type of failure occurred over bases and subgrades having high plastic properties and seemed more pronounced on projects in the coastal area, where poorer drainage conditions no doubt tended to increase the plasticity of the subgrade and base materials. Light re-treatments were generally successful in repairing areas where failure of this sort occurred.

Physical and chemical analyses of the tar mats on these roads showed that, while no doubt tar on the top surface of the road exposed to light and oxidation may be quite hard, the consistency of the tar extracted throughout the entire mass of the surface mat did not indicate in general any detrimental hardening on those projects which used a hot tar for the second application and a lighter cold tar for seal.

Georgia Formula for Spray for Killing House Flies

The following formula for a home-made fly spray was submitted to "Georgia's Health" by Dr. M. A. Fort.

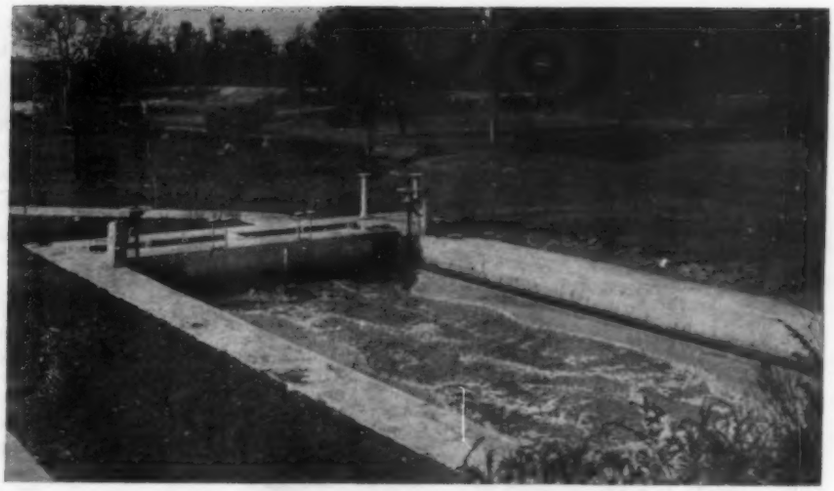
Obtain from the druggist three-fourths of a pound of insect powder-pyrethrum (Pyrethri Flores powder). It should be brown in color. Put this powder in a jug that will hold a gallon and add to it half a gallon of kerosene oil. Let it stand four days, shaking it well twice each day.

After having extracted the properties from the powder, fill the jug with kerosene and shake thoroughly. Let it stand another day and strain through a cloth that will remove the powder completely. Add enough kerosene to make a gallon. Use in an ordinary spray gun. Always spray toward the ceiling in a room. Keep the room tightly closed for one hour after spraying.

If you object to the kerosene odor, your favorite odor can be added by securing from the druggist the essential oil giving the odor desired.

[Ed. Note: The directions sound strangely familiar but the components are a little unusual.]

By Frank C. Roe
Sanitary Engineer,
The Carborundum Co.,
Niagara Falls, N. Y.



Pre-aeration tank at Springfield, Ill.

Pre-Aeration of Sewage by Air Diffusion

For Grease Removal, Improvement of Sedimentation and Odor Control

REGARDLESS of type of treatment, the reduction of the oil, grease and fat content of sewage is something every sewage works superintendent will welcome. It is one of the most, if not the most, troublesome constituent of sewage, as borne out by complaints of city engineers, superintendents, operators and other in charge of plants. It is also unsightly and odorous.

When removed with settled sludge, grease is difficult to digest in digestion tanks or in Imhoff tanks. If trickling filters are employed as secondary treatment, nozzles or distributors may become inefficient due to grease, and the filamentous biologic growth on the stone media may be inhibited, which is more serious. The proper operation of intermittent sand filters is also seriously hampered due to clogging of sand by oil and grease. Where activated sludge is utilized for complete treatment, the existence of grease or oil is very serious if it carries through to the aeration units, affecting bacterial and protozoan life and preventing proper oxidation.

Where the discharge of screened sewage into large bodies of water is permitted because of high dilution factors, the removal of grease and oil is highly desirable. This obviously controls much of the evidence of sewage on the surface at the point of discharge and eliminates the objectional oil and grease which tends to travel back to shore.

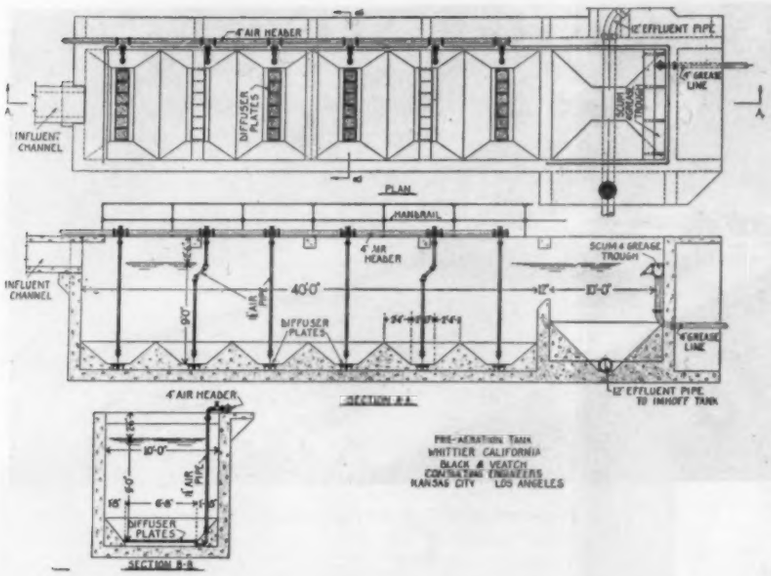
The above considerations furnish ample justification for inclusion of some method of effective grease removal in every plant. Pre-aeration by means of air diffusion offers a positive and successful method. Emulsified particles of grease and oil in the raw sewage adhere to the small rising air bubbles and are thus carried to the surface, where they form a scum. A scum trough or launder at the outlet end of the pre-aeration unit where there is no agitation is one good method of actual removal of this scum. It may be allowed to flow to preliminary settling tanks, if the sludge collecting equipment of said tanks functions dually in carrying scum to one point for removal.

Surprisingly large quantities of grease are removed by pre-aeration, averaging as high as 7 cu. ft. per million gallons of sewage in some plants. At Springfield, Ill., 40 to 54 cu. ft. a week is removed from a domestic sewage flow averaging 7 mgd. (This is a small unit originally built experimentally.) The accompanying table shows results, in parts per million, on monthly composite samples taken from the Dodge City, Kansas, plant designed by Black and Veatch of Kansas City, Mo. This is a 2¼ mgd capacity plant with a pre-aeration period of approximately 13 minutes, based on flow at design capacity.

The Dodge City results illustrate that pre-aeration is an appreciable aid to preliminary sedimentation of suspended solids, with a corresponding reduction of

Date	Fats			Suspended Solids			B. O. D.		
1932	Raw	Settled	% Removed	Raw	Settled	% Removed	Raw	Settled	% Removed
6-29	215.6	44	63.0	330	75	77.4	350	130	63.0
7-26	25	14	44.0	290	110	62.0	130	60	54.0
8-26	67	37	45.0	170	76	55.0	150	130	13.3
9-27	89	18	62.5	223	43	80.0	240	90	62.5
11-1	..	..	....	176	38	78.0	205	83	59.0
11-30	..	..	....	226	38	83.0	400	104	74.0

Results on Monthly Composite Samples from Dodge City plant



Pre-aeration tank at Whittier, Calif., showing method of installing diffuser plates

B.O.D. This indicates that customary settling tank capacities may be reduced under certain conditions by pre-aeration.

In addition, pre-aeration prevents odors at a plant, which is very desirable where the sewage arrives in a septic condition. This is particularly true if the sewage does not receive treatment of the activated sludge type, which would control odors.

Pre-aeration periods ranging from 10 to 30 minutes (depending on the strength and condition of sewage) are found to be effective and efficient. From 1/10 to 1/20 (and less) cu. ft. of air per gal. of sewage is used, decreasing as the plant capacity increases because of greater efficiencies and reduction of short circuiting in the pre-aeration unit or units.

Practice to date has developed no definite design of pre-aeration tank, although a modification of the "ridge and furrow" design used for activated sludge treatment has proven satisfactory, probably because a maximum benefit must be obtained from rising air bubbles instead of from surface aeration. With this design the diffuser area required is from 20 to 30 sq. ft. per mgd capacity and is usually about 10% of the area of the pre-aeration unit. On this basis, assuming the above data on air requirements, each square foot of diffuser area will deliver not more than 3 cu. ft. of air per min. Diffusion at this maximum rate should be economical.

The writer's experience with diffusers of the fused crystalline alumina type indicates that pressure loss due to frictional resistance at the maximum rate should not exceed 10" of water. This assumes the use of diffuser plates of the finer grade (say 15 permeability), which are advisable where maximum benefit is derived from air bubbles. If coarser diffuser plates of about 30 permeability are used, giving larger bubbles, the pressure loss should not be more than 6" of water.

Good design is illustrated by the pre-aeration unit at Whittier, California, which has a capacity of 1.8 million gallons per day, the aeration period being about 19 minutes at capacity flow. The area at one end of this unit for grease and oil scum collection, with removal of the same by trough and separate line, is to be noted. The tank effluent is at the bottom of this section, thus eliminating grease and oil as much as possible from the Imhoff tank which follows.

Places where pre-aeration units are in use, in addition to those already mentioned, are Tulsa, Oklahoma; (Flat Rock and Coal Creek plants); Wichita, Osage City and Abilene, Kansas; Cleveland. Ohio; Pasadena, California, and Flint, Mich.

The results obtained by pre-aeration and the economy of its use recommend it as a valuable addition to any existing or contemplated plant. Those who have had experience with it recommend it unqualifiedly. Grease and oil are found in all sewage, and removal of them results in marked improvements in every phase of treatment. Pre-aeration by air diffusion will effect the desired removal and will improve the efficiency of settling and control odors at the same time.

The writer wishes to acknowledge the courtesy of F. M. Veatch of Black and Veatch, consulting engineers, Kansas City, Mo., and W. B. Walraven, district engineer, Springfield Sanitary District, in furnishing much of the information and data used in the foregoing article.

Corrosion of Water Mains and Services

Studies of internal corrosion of distributing mains and services continued throughout a first few months of the year 1932. Upon the completion of these, all data covering studies of the subject for the past 8 years were assembled. The preliminary conclusions concerning practical methods of detecting and combating internal corrosion in distributing systems appear to be that (a), the assumption that reduction in dissolved oxygen at points on the distribution system is indicative of active corrosion is in close agreement with fact; (b) this determination, together with measurements of free carbon dioxide, alkalinity, hydrogen-ion concentration, and calcium carbonate saturation equilibrum, are useful joint measuring devices of relative degrees of active internal corrosion in water systems; (c) where corrective measures against corrosion by use of lime are instituted, routine pH and alkalinity tests offer practical means of control.

Agencies responsible for internal corrosion of water mains other than the soft aggressive waters have been found to complicate the problem of entirely eliminating "red water" difficulties. Our studies indicate that such probably additional causative agents are inferior grades of house plumbing material, dissimilar metal connections in either house and service lines or both, and possibly excessive bio-chemical activity in "dead ends" and sections of the distribution system where the circulation is unusually light.

From Annual Report of the Bureau of Sanitary Engineering, Maryland State Department of Health, Abel Wolman, chief engineer.

THE EDITOR'S PAGE

National Recovery

Washington reports, as we go to press, indicate that some consideration is being given by cabinet members to withholding a part of the three billion dollar public works program. This is suggested under the familiar guise of requiring balanced budgets and limiting the expenditures to certain types of construction. The reasons given are generally that recovery is now well under way, that the expenditures are not now necessary, and that the money should be saved rather than used for providing employment for thousands still dependent upon relief measures provided by the public.

To create hope and then destroy it is surely lack of leadership, and the unfavorable reactions that would result from such a course would go far to retard recovery. We have only to look back at the futile record of the RFC, operating under much the same policy, to recognize this. The bankers who dictated the expenditures of that organization sought mainly to loan money on collateral to pay debts, but did not advance it to be used in recovery through construction.

We hope that every industry, every engineer, every contractor, and everyone else interested in recovery through needed and useful construction will register at once a protest against the withholding of these funds. Write your senators and congressmen at once. We have already written ours.

Hand Labor and the National Recovery Act

The Bureau of Public Roads has issued regulations governing the employment of hand labor on highway construction projects. These regulations are generally reasonable and sound. Every effort has been made to comply with the intent of the law, and previous rules and regulations have been materially modified in regard to the use of hand labor.

Considering that a 30-hour week is required, instead of the present 44 to 54 hours; that wages must be paid that will enable the laborers to live "decently"; that preference must be given to older men, war veterans and those with dependents; and that practically all will be inexperienced in, and many physically incapable of, the most effective use of picks, shovels, wheelbarrows and similar equipment, it must be evident that such labor may cost two, three or four times as much as it ought.

Under the new regulations, hand labor, with or without teams, is required for clearing and grubbing, but explosives may be used to loosen stumps; hand labor is required for trimming and grading slopes and ditches; for certain work in subgrading; for trenching and back-filling drains of 24-inch diameter or less and for unloading, handling and placing such pipe except when it is of cast iron; for unloading cement and steel; for moving aggregates from stock piles to mixers; for moving concrete from the mixer to the form, in the case of curbs, gutters, bridges up to 50-foot span, culverts, etc.; for brooming and sweeping road surfaces and bases, spreading chips, etc. Mechanical painting equipment for guard rails and bridges and mechanical drills and saws are prohibited.

Thus it will be seen that concrete may be mixed in the usual efficient and economical way, even on small structures and that other equipment necessary for high quality work and reasonable costs may be employed. Under certain conditions, hauling equipment may be limited to teams and to trucks of not more than 1½ tons capacity. Hand and team labor may also be required on certain grading and excavation work.

During the past three months the writer has been closely connected with construction (of a needed and useful project) in which a considerable amount of hand labor has been employed. The men engaged have been of generally high quality, for this was not a relief project primarily, in the usual sense of the term. Good wages were paid and the men required to earn them. The conditioning necessary over the first three weeks was painful, alike to the men and to the responsible supervisors. On a recent extremely hot day, three-quarters of the men could not continue after four hours of work.

Hand labor should not be used more than is necessary. To use it may temporarily relieve our present situation, but it is a step backward—economically, humanely, and in the interests of best construction.

Sanitary Engineering and the C. C. C.

Some 275,000 men are now established in more than 1300 CCC camps throughout the country. A fine job has been done in collecting, organizing and conditioning these men. But how about the sanitary and health conditions surrounding them? What about water supplies and waste disposal facilities?

Without the well-known "MP" to stand guard over all unauthorized water supplies, the water furnished to these camps must compete with all unauthorized sources as regards taste, odor, appearance and temperature. And it must be safe. The policy of decentralization has worked well in getting these men into the camps. How has it worked in providing them with safe and attractive water? And with safe and sanitary waste disposal?

Complete dependence for technical assistance in this highly specialized field cannot be placed on the depleted and overworked staffs of the state health departments. The CCC should have an able and reliable organization of its own. There are a good many well-trained young engineers available right now. They ought to be taken on at a reasonable rate of pay. And the water supplies, at least, ought to be safeguarded with standardized and reliable equipment that will eliminate any opportunity for water borne diseases. A parsimonious and short-sighted policy in regard to health protection has always reaped its own reward; we sincerely hope that full attention will be given to this matter in the very near future. "Later" may be "too late."

Upper Darby Did More Highway Work in 1932 Than in 1931 and at Two-Thirds the Cost

THE Upper Darby, Pennsylvania, Highway Department has issued a report of its activities for the year 1932 in which a highly commendable administration of the department is told in an excellent manner—concisely, but giving apparently all the essential facts. In spite of the conciseness, the report fills 12 mimeographed pages and we can give only the more striking of the points it contains.

Although the appropriation for highway work was $20,000 less than in 1931, $15,000 of it was left unexpended; in other words, the department spent $110,000 in 1931, but only $75,000 in 1932, "without reducing in any way the quality and quantity of services rendered to the public." The actual saving was really more than this, since $3,700 of the expenditure was for two pieces of equipment not included in the budget.

Reduced Expenditures

Seventeen thousand dollars of the saving was in the pay roll. When a reduction in this was decided to be necessary, the employees were called together and entered heartily into a plan for retaining all of them in service but reducing the hours worked from 50 to 40 a week but with no change in hourly rates; each man to be expected to do as much in the 40 hours as he formerly had done in 50. "The results have been most satisfactory." Among the officials there were considerable salary reductions. One thousand dollars of this was from the chief engineer's salary. One assistant engineer at $2,800 replaced an assistant engineer at $1,800, a surveyor at $2,800 and the highway engineer at $4,000; also, together with the chief engineer, the chief building inspector at $3,500. A clerk at $1,500 replaced a $2,500 chief clerk. Instead of the nine highway inspectors employed in 1931, two handled the work for the greater part of 1932.

An appreciable saving was made in the purchase of materials by letting contracts in the spring, based on detailed specifications, for supplying materials throughout the entire year as called for. The specifications were carefully drawn and the quantities which would be needed stated, and considerably lower prices obtained than in previous years when annual contracts were not let.

In 1931, resurfacing the highways cost $1.25 per square yard. In 1932 a different type of resurfacing was contracted for at 56 cents per square yard, including scarifying and reshaping, a complete survey of conditions and program of work for the year enabling the department to tell the bidders the approximate amount to be done. The method adopted for 1932 consisted of scarifying and reshaping and adding two inches of bituminous concrete (specification E). This gave better results than the previous method, as well as costing less. This resurfacing was done on 27,462 square yards.

A minor saving was effected by using concrete mixed at a central plant instead of by the town forces; this concrete not only being delivered on the job at a lower cost but also being of more uniform quality.

Another saving was effected by having street signs made by the department. Two men painted all the new signs last year, the metal for the signs and iron pipe poles being purchased cut to length. The signs cost the town $2 each, whereas those purchased in 1931 cost $14 each.

Equipment

In the spring of 1932 the only street cleaning equipment was a four-wheel pick-up sweeper which had been used many years and was constantly in need of repairs. Due to its low speed and long turning radius it was impossible to sweep the streets oftener than once in two weeks. This was replaced with a three-wheel pick-up sweeper with an operating speed of 7 miles per hour which could turn in a 20-foot roadway, the old machine being kept in reserve. The new machine was operated 15 hours each day in two shifts, and cleaned the 110 miles of paved streets once a week and the business section twice.

Other equipment comprises a 5-ton road roller, a 10-ton roller and scarifier, three 5-ton trucks, a concrete mixer, cold-patch mixer, chip spreader, crack filler torch, and portable pumps.

Efficiency of all motor equipment has been increased greatly and maintenance costs lowered by weekly inspection by a skilled mechanic with prompt repairs, regular changing of oil and greasing, and general close attention to its condition. Spare parts are kept on hand at all times. Daily reports show the amount and location of work done by each piece of equipment and the amounts of gasoline, oil and alcohol used by it.

The mixer for bituminous patching material is served by a 600-gal. asphalt storage tank. For winter patching, asphalt is obtained in drums.

Highway School

There has been an excellent spirit of cooperation among the employees, due largely to the highway school inaugurated by Samuel H. Walker, chairman of the highway committee, which includes all the employees of the Department of Public Works.

At least one meeting of the school has been held every month, two or three some months. Lectures were given by representatives of the Portland Cement Association, Asphalt Institute, Philadelphia's city asphalt plant, and others. Albert F. Damon, Jr., chief of the department, and William Reeder, assistant engineer, spoke often on local problems. These lectures were supplemented by motion pictures and laboratory demonstrations. Members of the highway committee attended each meeting and spoke on the department's problems.

These meetings held the interest and attention of the men throughout the year and the increase in efficiency and morale in the department during the year is in a large measure attributable to this school.

WATER PURIFICATION STUDIES

Bacterial Changes in Chlorinated Filter Effluents

By H. W. Streeter
Sanitary Engineer, United States Public Health Service

THE following brief paper is the first of a series being prepared for PUBLIC WORKS on several phases of water purification studies by the U. S. Public Health Service which heretofore have not been dealt with in published reports of these investigations, or have been mentioned in them only incidentally. As indicated in an introduction* to this series prepared by the Editor of PUBLIC WORKS, previous reports of these studies have been concerned mainly with their primary objectives, namely, the efficiency and limitations of current processes of municipal water purification and various possible means for increasing bacterial efficiency. Incidentally, data have been gathered bearing on certain practical details of water treatment, which can be discussed more advantageously in the present series of articles.

The tendency of chlorination to bring about temporarily a condition of biologically unstable equilibrium in water treated by this process is fairly well known, though not always fully appreciated, particularly as regards some of the more important factors which appear to govern this phenomenon. It may be of interest, therefore, to describe in this paper some observations made during the course of these studies on the progressive bacterial changes occurring in a chlorinated filter effluent, when held in storage at two widely different temperatures for periods varying from a few hours to several days after chlorination.

These observations were made in connection with the operation of an experimental rapid sand filtration plant, located at the Stream Pollution Investigations Station of the U. S. Public Health Service at Cincinnati. They consisted of two series, one carried out during the winter, with water temperatures averaging about 40°F., and the other during the summer, with corresponding temperatures averaging 75°F. In the winter series, representative samples of the unchlorinated rapid sand filter effluent were placed in sterile 5-gal. glass carboys, chlorinated to various degrees and then stored for periods up to 9 days, during which time sub-samples were removed from the carboys at regular intervals and their residual chlorine and bacterial content determined. In the summer series, the same general procedure was followed, except that in addition to being stored in carboys, the chlorinated effluent was also stored in a 1000-gal. concrete filtered water reservoir located under one of the experimental filters. The reservoir had been thoroughly cleaned prior to the experiment.

In some of the tests, the filter effluent was pre-inoculated, in a few cases with sewage and in a few others with broth cultures of coli-aerogenes bacteria, in order to increase the initial bacterial content before chlorination. The bacteriological tests made included the 24-hour, 37°C. plate count on standard agar medium, the confirmed coli-aerogenes index by means of the usual lactose broth fermentation test and, in the summer series, a direct-plate count on Endo's medium, which is fairly selective for bacteria of the coli-aerogenes group.

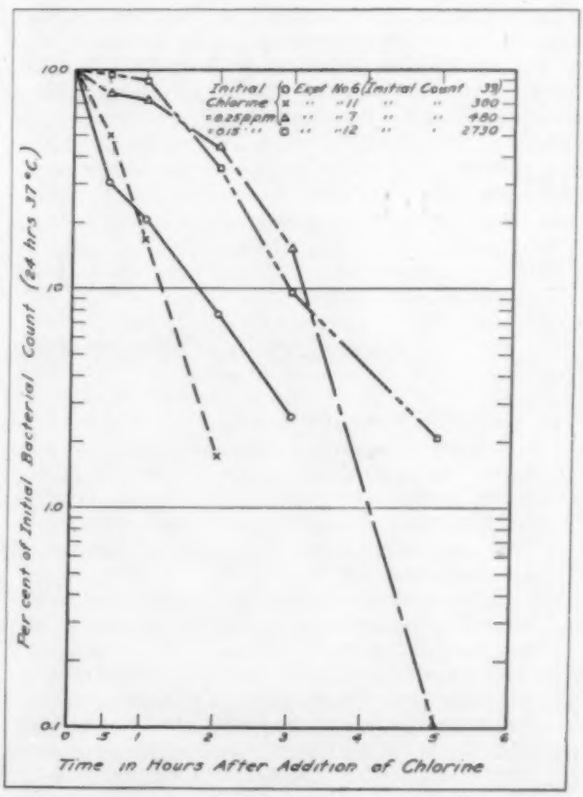

Initial Chlorine
○ Expt No 6 Initial Count 39
× " " 11 " " 380
△ " " 7 " " 480
□ " " 12 " " 2730
100
10
1.0
0.1
Per cent of Initial Bacterial Count (24 hrs 37°C.)
0 .5 1 2 3 4 5 6
Time in Hours After Addition of Chlorine

FIG. 1. *Progressive bacterial changes in chlorinated filter effluent —Winter temperature (average, 40 degrees F.)*

* See PUBLIC WORKS, Vol. 64, No. 6, June, 1933, pp. 12-14.

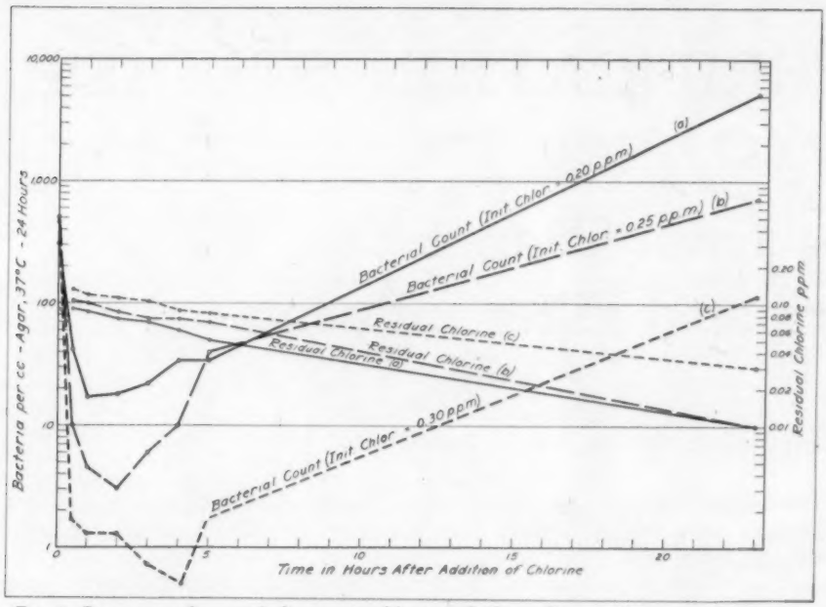

Bacteria per cc - Agar, 37°C - 24 Hours
Residual Chlorine ppm
Time in Hours After Addition of Chlorine
Bacterial Count (Init Chlor = 0.20 p.p.m.) (a)
Bacterial Count (Init Chlor = 0.25 p.p.m.) (b)
Bacterial Count (Init Chlor = 0.30 p.p.m.) (c)
Residual Chlorine (a)
Residual Chlorine (b)
Residual Chlorine (c)

FIG. 2. *Progressive bacterial changes in chlorinated filter effluent—Summer temperature (average, 75 degrees F.)*

The results of twelve experiments made in the winter series showed invariably a progressive decrease in bacteria up to 9 days after chlorination, with no secondary increase either in the total plate count or in the coli-aerogenes index. Corresponding results of nine tests made in the summer series showed with similar invariability a secondary rise in the total bacterial count and in the Endo count, though little conclusive evidence was obtained, from the fermentation tests, of any well-marked increase in coli-aerogenes bacteria. In both series, measurable amounts of residual chlorine were present in the water throughout the greater part of the storage period, ranging from 0.02 to 0.12 p.p.m. The dosage of chlorine added varied, in the different experiments, from 0.15 p.p.m. to 0.40 p.p.m.

In Figure 1 is shown a plot of the results of four representative tests of the winter series, three with 0.25 p.p.m. of chlorine added and the fourth with 0.15 p.p.m. The period of contact after chlorination is plotted on the linear abscissa scale and the percentage of initial bacteria remaining, on the logarithmic ordinate scale. Two of the plots (Nos. 6 and 11) follow very nearly straight-line trends, indicative of a logarithmic rate of bacterial decrease. The other two (Nos. 7 and 12) show a distinct period of lag, followed by a similarly logarithmic rate of decrease. In their logarithmic phases, these plots are shown to conform to the normal law of disinfection, allowing for variation due to experimental error. The presence of a lag phase in two cases and its absence in the two others is somewhat difficult to explain, but is probably due mainly to the effect of higher initial bacterial content and, in one case, a lower amount of chlorine added. The amount of residual chlorine left after 5 hours ranged from 0.02 to 0.07 p.p.m. in the four tests. In no case did it exceed 0.10 p.p.m. at any time during the period of contact.

Figure 2 is based on averages from the portion of the summer series tests made on chlorinated effluent stored in the filtered water reservoir and having initial chlorine dosages of 0.20, 0.25 and 0.30 p.p.m., respectively. In this chart, the progressive changes in residual chlorine are indicated in parallel with those in the total bacterial content. As practically the same results were obtained in the same series from parallel tests made in glass carboys, a similar plot of these results has been omitted here.

Aeration of Water Eliminates Taste and Odor

ABOUT two years ago the village of Springville, Erie county, developed a new source of water supply derived from a well which tapped glacial gravels underlying a thick bed of clay. The water drawn from the well was of satisfactory sanitary quality but upon delivery to consumers had an objectionable taste and odor.

After a series of experiments an engineer employed by the village devised a solution of the problem. Upon finding that the water was practically devoid of dissolved oxygen, he installed an air compressor for the purpose of forcing air into the discharge side of the pump. The taste was thus eliminated but the cost of operating the compressor was considerable. This difficulty was overcome by the installation of a small pipe connected to the suction side of the deep well pump. The volume of air taken in by the pump was controlled by valves on this line, the intake being screened to prevent the entrance of dust. Methods of washing and measuring the air are in process of development.

Analyses have shown that the well water drawn from the ground contained from 0.10 to 0.20 p.p.m. of dissolved oxygen. It was further found that by maintaining 1.9 p.p.m. of dissolved oxygen in the water leaving the pump and entering the distribution system, no tastes or odors occurred in the water delivered to consumers. Analyses of samples at the ends of the distribution system showed a dissolved oxygen content of 0.50 p.p.m., which apparently is the amount necessary to prevent tastes and odors.—(N. Y. Health News.)

The striking difference in behavior of the bacteria following chlorination, shown in Figure 2, in comparison with that indicated in Figure 1, appears to be due to the wide divergence in temperatures at which the two series of observations were made, as all other conditions under which the experiments were conducted were virtually identical. An orderly relation is shown between the amount of chlorine added and: (a) the position of the minimum bacterial content following chlorination, (b) the period of lag before multiplication began, and (c) the maximum extent of growth attained at the end of 23 hours. It will be further noted in Figure 2 that a secondary increase in the numbers of bacteria did not begin until after the residual chlorine fell below 0.1 p.p.m., but that it did occur very actively in the presence of residuals which exceeded about 0.05 p.p.m.

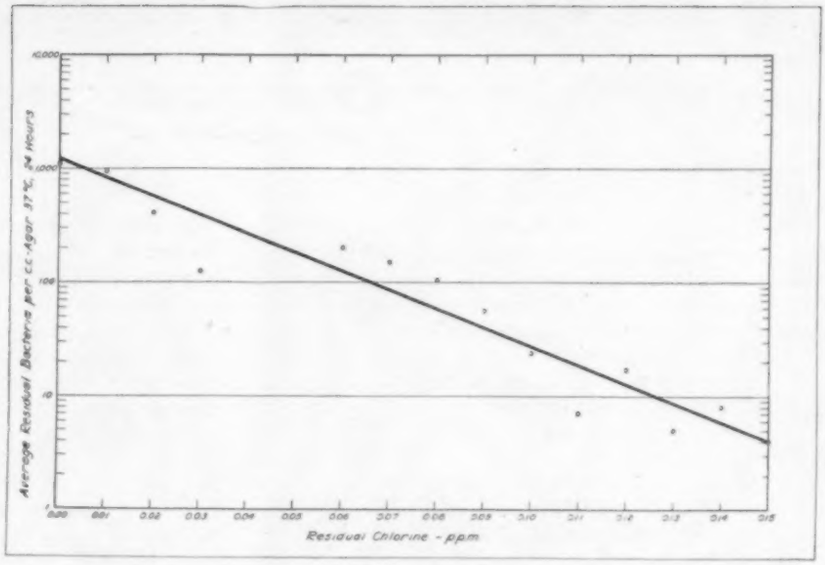


FIG. 3. *Relation between residual chlorine and average bacterial content of chlorinated effluent.*
(Bacterial counts, 24 hrs., 37° C.)

A comparison of the rates of bacterial decrease observed in the two series of tests, immediately following chlorination, indicates that with about the same initial numbers of bacteria and amounts of chlorine added, the rate of decrease was roughly 3 or 4 times as rapid at 75°F. as it was at 40°F. This is entirely consistent with the behavior of disinfectants in general at different temperatures and serves further to emphasize that the laws governing water chlorination are the same as those of disinfection in general.

Effect of Residual Chlorine

The marked effect of residual chlorine content of the water on the average numbers of bacteria surviving chlorination is illustrated in Figure 3 by a plot derived by averaging the bacterial counts obtained in the chlorinated water stored in the clear well at the summer temperature, with residual chlorine values equal to various amounts ranging up to 0.15 p.p.m. The line drawn through the plotted points is intended merely to indicate their general trend. The considerable scatter of the points is due to the fact that they represent averages taken regardless of contact period or initial bacterial numbers present in the unchlorinated water.

From these two series of comparatively simple experiments, two conclusions of practical significance may be drawn. The first is that the rate of destruction of bacteria by chlorine is essentially a function of time, varying with temperature and conforming to the laws which govern disinfection phenomena in general. The second is that with a residual chlorine content less than about 0.1 p.p.m., a secondary multiplication of some of the bacteria originally present can occur at summer-temperatures, but apparently does not take place at winter temperatures.

If this experimental evidence is fairly representative of what might be expected to occur in practice, it indicates clearly the need, recognized by many designing engineers, of providing adequate facilities for the storage of chlorinated water prior to discharging it into a distribution system, particularly where the time required for water to reach some consumers is only a matter of minutes after it enters the system. In this respect, winter conditions are the more critical, owing to the retarding effect of low temperatures on the bactericidal action of chlorine. It also serves to emphasize the necessity of maintaining a residual chlorine content of effluents always in excess of a critical minimum value, depending on the shortest length of storage period provided at any time.

Secondary Growths of Bacteria

The occurrence of secondary bacterial multiplication at summer temperatures and its marked absence at winter temperatures, with chlorine residuals up to about 0.1 p.p.m., serves to explain the more or less common observation that secondary growths of bacteria in water distribution systems occur much more frequently in summer than in winter, and likewise indicates that ordinary water bacteria growing at 37°C. may be expected to multiply at summer temperatures in distribution systems where the residual chlorine content falls below 0.1 p.p.m. From this viewpoint, the advantage of ammonia-chlorine treatment in permitting the maintenance of higher residuals throughout the distribution system is manifest, though this advantage tends to be offset by the well-recognized lag effect of chloramines in accomplishing the degree of bactericidal action necessary for safety to near-by water consumers.

The evidence afforded by these experiments as to whether or not bacteria of the coli-aerogenes group can multiply in water containing measurable amounts of residual chlorine has been inconclusive, though the secondary increases observed in the direct Endo plate count in the summer series have suggested the possibility that such multiplication might occur under favorable temperature conditions. Further observations will be needed, however, before this question can be more definitely answered.

[Ed. Note: Other articles by Mr. Streeter will appear in early issues of PUBLIC WORKS.]

Water Coagulation With Ferric Chloride

By Robert Newton Clark
Of Innis, Speiden & Co.

FOR years alum has been used in the majority of plants and generally thought of as the standard coagulant because, of the several which have given the best results in practice, it has been the least expensive. Filtration experts have realized, however, that, aside from cost, alum may not be the best coagulant under all or even many conditions.

During the past two or three years attention has been called to ferric chloride, partly perhaps because of its successful use in sewage treatment but chiefly because its cost has been reduced to the point where it can compete in this respect with alum.

A number of tests comparing alum and ferric chloride show very decidedly that less of the latter than of the alum is needed to effect a given reduction in turbidity. The results of two such tests are shown in the accompanying diagrams. In all cases the mixing time was 22 minutes.

In the A test, after settling 60 minutes the turbidity had been reduced from 52 p.p.m. to about 37 with alum and to 17.5 with ferric chloride when 50 pounds of chemical per million gallons had been applied. With 75 pounds, to 24.5 and 13, respectively. With 125 pounds, to 12 and 7.5. In the B test, with a raw water turbidity of 32, the 22-minute turbidities were 16 and 7 respectively with 50 pounds of chemicals, 9 and 4.5 with 75 pounds; 6 and 3 with 100 pounds, and 4.5 and 3 with 125 pounds.

Comparing the results in terms of chemical used to produce a given reduction in turbidity, we find in the A test that the turbidity was reduced to 35 with 60 pounds of alum or with 25 pounds of ferric chloride; to 25 with 75 pounds and 27.5 pounds respectively; to 15 with 100 pounds and 63 pounds; and to 7.5 with 175 and 125 pounds. In the B test, turbidities were obtained as follows: 20 turb., 37 and 23 pounds respectively; 10 turb., 74 and 40 pounds; 5 turb., 110 and 65; 3 turb., 150 and 85.

These figures show similar turbidities obtained with from 37% to 70% as much ferric chloride as alum, averaging 55%. Tests at Midland, Mich., with water of 33 p.p.m. turbidity showed similar reductions with 55 to 62% as much ferric chloride, averaging 59%.

Ferric chloride is sold commercially in several forms and concentrations. The above comparisons are based on the weight of lump (60%) ferric chloride and dry water works alum.

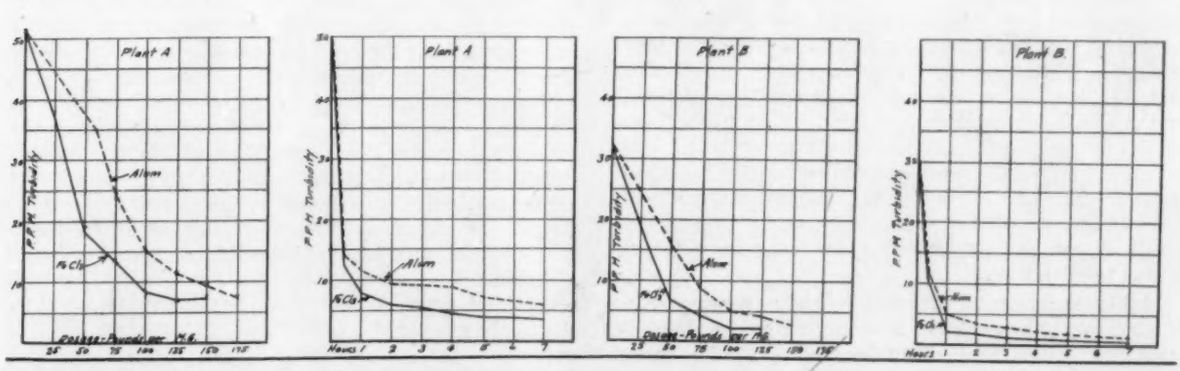
By these experiments it would be indicated that where the cost of ferric chloride did not exceed that of alum by more than 65 to 70 percent, the former could be used at less cost than the latter.

Another saving, also, is possible due to the more rapid settling of the iron floc, and the fact that it forms more quickly—ranging from two minutes under ideal laboratory conditions to ten or fifteen in actual operation. This is shown in diagrams Nos. 2 and 4. For all times of settling varying from one to 7 hours, and using 125 pounds of chemical, the turbidity was reduced a given amount in a considerably less time when using ferric chloride than when using alum. In the A tests, 10 p.p.m. was obtained in 2 hours with alum but in about 40 minutes with ferric chloride. Eight p.p.m. were reached in about 4½ and 1 hour respectively; 6 parts in 7 hours and 2½ hours. In the B tests the times for 3 p.p.m. were about 3 hours and 0.8 hour respectively. It thus appears that similar clarification can be secured by use of a much smaller sedimentation tank. This makes possible continuing to use a tank which had been outgrown for use with alum coagulation. Or, with a given size of sedimentation tank, since the turbidity reduction is greater a smaller filter can be used or longer filter runs made.

Also, there are certain limitations in the use of alum. Either overdosing or underdosing may result in alum being carried through the filters. Overdosing with ferric chloride may be a waste of chemical but does not result in a loss of coagulating effect; while very low doses will often give characteristic, easily filtered floc. Even in relatively clear water, doses as low as 15 pounds per million gallons have been reported as effective in floc formation.

Again, the pH range for alum flocculation is less than that for ferric chloride, which is effective for precipitation under proper conditions at any point above pH 5.0; and variations in result due to deviation from the optimum pH are not as marked as with alum.

In very soft water, color removal can be effected with ferric chloride below the range of alum coagulation, where the addition of artificial alkalinity would "set" the color.



Comparison of ferric chloride and alum in the coagulation of water. In the first and third charts the mixing time was 22 minutes and the settling time 60 minutes. In the second and fourth the mixing time was 22 minutes and the chemical dosage was 125 pounds per million gallons, with the settling period varying from 1 to 7 hours.

Chlorine

Chemicals for Industry
SULPHATE OF ALUMINA
PERCHLORON
FERRIC CHLORIDE
(60% Crystals)

The dependable quality of this product is the result of more than eighty-two years' experience in making chemicals for industry.

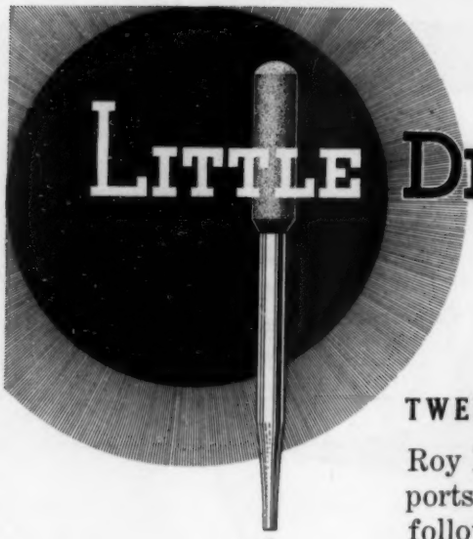
Furthermore, due to the convenient locations of our plants, we are able to make deliveries of Chlorine in the fastest possible time.

You can also get highly specialized technical advice if you wish it.

Est. 1850 TRADE MARK
PENNSYLVANIA SALT MFG. CO.

EXECUTIVE OFFICES, WIDENER BLDG.
PHILADELPHIA, PENNSYLVANIA

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54



LITTLE DROPS OF WATER

Little grains of Carbon

TWENTY DROPS OF WATER MAKE ONE GRAM

Roy M. Allen, Microscopist of Bloomfield, N. J., reports a count of 4 prominent commercial carbons as follows:—

CARBON B.....6,110,000,000 particles per gram
CARBON A.....23,760,000,000 particles per gram
CARBON C.....38,000,000,000 particles per gram
AQUA NUCHAR. 92,500,000,000 particles per gram

(Mr. Allen's complete report will be sent you promptly on request.)

One cubic foot has 6 square feet of surface, but divided into 1,728 inch cubes, it has 72 square feet of surface.

Surface contact is the only way activated carbon can attack and adsorb impurities which cause taste and odor in water. The more surface the more adsorption.

As the General attacking an unseen foe, you want the largest and strongest force you can command, at your disposal. **AQUA NUCHAR** furnishes that army. Think of it—92 billion, five hundred million particles per gram of carbon. Try to compute the particles per 100 lbs. or per ton. It's too big a number for us to write—away beyond our comprehension.

AQUA NUCHAR fights the battle of freedom from taste and odor trouble for you, and does it better than other carbons, because its physical makeup leaves it in finely divided particles for complete dispersion and low in density for long suspension, whereby the maximum physical contact is maintained.

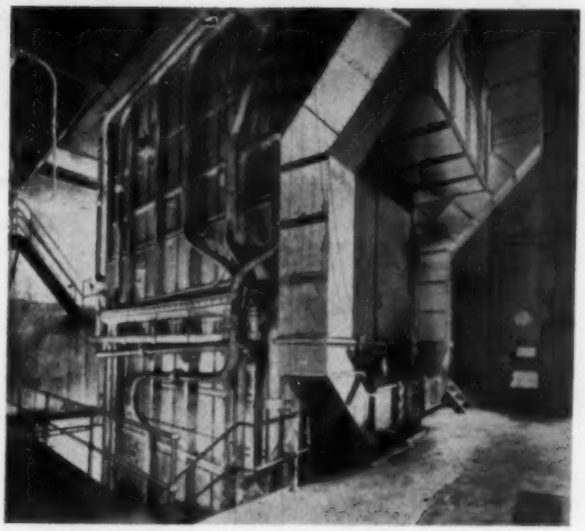
Our Technical Staff is at your disposal, and widely scattered warehouse stocks are readily available for quick delivery to you.

POWDERED ACTIVATED AQUA NUCHAR CARBON

Industrial Chemical Sales Co., Inc.

230 PARK AVENUE, NEW YORK, N. Y. **205 W. WACKER DRIVE, CHICAGO, ILL.**

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54



The new steam generating unit at McCarron Station, equipped with air pre-heater, water walls, and pulverized fuel combustion equipment, gives the department a most efficient and reliable unit. If found desirable at a later date, this unit can be used with a turbo generator to develop electric power for use at both McCarron and the Mississippi River Station.

St. Paul's Successful Water Works

AMONG the water works plants in large cities which may be considered to be conducted successfully, that of St. Paul holds a commanding position. Success in water works administration may be adjudged from several viewpoints. Among these are universality of use by citizens; quality of water; quality of service; economy of operation; and business ability shown in financing.

In 1932, of the 277,000 population (estimated) of St. Paul, all but about 2,000, or 99.3 per cent. were being supplied with water, and these were in the outskirts where the distribution system had not yet been extended.

Water Supply Data

The turbidity of the water furnished was 0 in all cases; average color, 12.1; iron, 0.04; permanent hardness, 25; temporary hardness, 140; bacteria, 48 hrs. at 37°, 9 per cc in plant effluent, 347 in city taps; colon index, 0.004 plant effluent, 0.46 city taps. The Board is considering softening the water.

The pressure ranges from 30 to 100 pounds in different parts of the city. Only 2.5% of the distribution system is less than 6-inch diameter. During the year there were only 15 leaks in the 602.3 miles of mains; total cost of repairs was $2.03 a mile, and of maintenance, $18.78 per mile. The average daily consumption was 83.9 gallons per inhabitant, or 370 per tap.

The percentage of services metered was 99.5; percentage of consumption through services metered, 98.4. Used for fires, flushing mains, leakage and other unaccounted-for water, 16.4%.

Financial Statistics

The cost, per million gallons of water, of administration and general was $15.93; of production, $15.32; of distribution $22.72; total operation and maintenance, $53.97; fixed charges $54.82. The cost of filtration, including cost of wash water and $1.98 for alum, liquid chlorine, and ammonium sulfate, was $11.81 per million gallons.

The value of the plant and property, less depreciation, is $16,968,320, against which there was outstanding $6,963,000 in bonds. Of these, $4,300,000 were sinking fund bonds ($70,000 redeemed this spring) and $2,663,000 serial bonds. On December 31st the surplus was $10,215,000 and the sinking fund and redemption reserve $1,008,850.

The total revenues for 1932 averaged $121.17 per million gallons pumped or $18.34 per service; the average per domestic service being $11.14. The total costs of production, distribution, administration and maintenance, and fixed charges averaged $16.47 per service. The efficiency of management may be judged by the fact that total costs of operation and maintenance were $30,730 less than in 1931, and $5,114 less than the budget for the year.

The net operating profits (exclusive of return on capital investment of $49,907) were $88,793. "This amount, actually a working fund, is used for the purchase of materials for the ensuing year," said the Water Commissioners in their annual report. "When the present water rates were established in 1925 it was the determination of those concerned with their establishment that the department should properly have at least $100,000 annually as a net operating profit, in order to care for minor capital expenditures and the proper working fund for payrolls, etc. It is of interest that since 1925 this fund has averaged $101,995. A survey of fifty cities of 100,000 population or over, with municipally owned plants, shows an average cost of water to the domestic consumer of $1.13 per month, as compared to 95 cents a month as charged in St. Paul."

Keping Cost Records

Itemized records are kept of all operating costs. In the case of the 23 pieces of automotive equipment, for example, the cost is kept, for each car, of the gasoline, oils, tires and other supplies; service repairs, parts and accessories; and to each is charged its insurance, depreciation, and municipal garage overhead. The mileage of each is kept, and varied last year from 2,203 for a Dodge ¾ ton truck to 21,200 for a Ford 5-passenger coach. The total cost per mile (including all of the above) ranged from 3.2 cents for the Ford coach and a Ford pickup truck, to 20 cents for a Mack 2½ ton truck with dump body. (Depreciation charged was 52% of the latter and only 12% of the Ford pickup.) Of the $13,912 charged against the 23 pieces, $4,139 was for total operation, $3,273 for total maintenance, $5,466 for fixed charges, and $1,034 for municipal garage and other overhead.

The Board of Water Commissioners consists of Clyde R. May, president, Milton Rosen and Herman Wenzel. Leonard N. Thompson is general superintendent and engineer.

For Sewage and Water Treatment

"ISCO"

Ferric Chloride

Solution or Crystal

For Sludge Conditioning. Ferric Chloride has been accepted as the most efficient agent from the standpoint of quantity and cost.

For Coagulating Sewage. Ferric Chloride provides an inexpensive and effective method of dealing with plant overloads.

For Water Filtration. Ferric Chloride is an economical and practical coagulant. It gives a quick forming, fast settling floc.

"ISCO"

Chlorinated Lime

Use "Isco" Chlorinated Lime for water and sewage treatment.

No deadly gas danger.

No expensive equipment needed.

No containers to return.

Chlorinated Lime gives best results for sterilizing sewage effluent.

Distributors for **Cliff Char Activated Carbon** in various forms and grades for all purposes

Write for list of articles giving experiences of many plants in the use of FERRIC CHLORIDE

INNIS, SPEIDEN & CO.
117 Liberty Street New York, N. Y.

THE SLEET SEASON

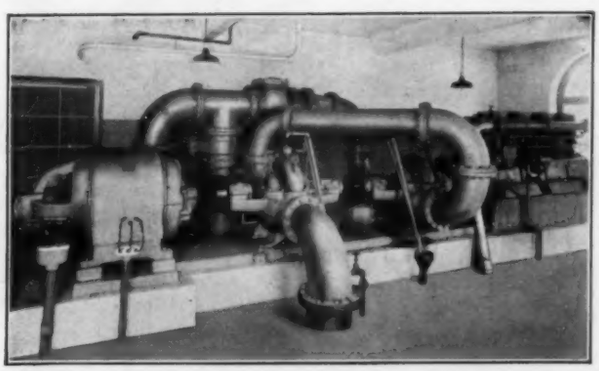
Wires, whipped by the wind, crystalized at point of fastening, coated with sleet, sag under the weight suddenly let go. Cities in darkness, pumps inoperative. Three essentials of living—power—light—water unavailable! Guard against power outage with

Sterling High Duty

Sterling — THE ENGINE OF REFINEMENT

Internal Combustion Engines

12 to 565 B.H.P.
Gas or gasoline



For standby in emergency, Goldsboro, N. C., has two Sterling engines, one a GRC-8 cylinder 240 H. P. 1200 R. P. M. engine and a 90 H. P. 1200 R. P. M. FC-4 cylinder engine direct connected to a DeLaval centrifugal pump. Sold through J. R. Purser of Charlotte, N. C.

STERLING ENGINE COMPANY

Home Office and Plant
1270 NIAGARA ST.
BUFFALO, N. Y.

DEPT. C-5

Branch Office
900 CHRYSLER BLDG.,
NEW YORK, N. Y.

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54

Operation of Columbus, O., Water Purification Plant

THE year 1932 of the Division of Water of the city of Columbus, Ohio, reflected the depression in several ways. Consumption was 9 per cent less than in 1931, disbursements 12 per cent and receipts 9½ per cent. Delinquent water accounts increased from $9,012 in 1931 to $47,110 in 1932. There were only 288 requests for new service connections, as compared to 717 in 1931 and 2,343 in 1928.

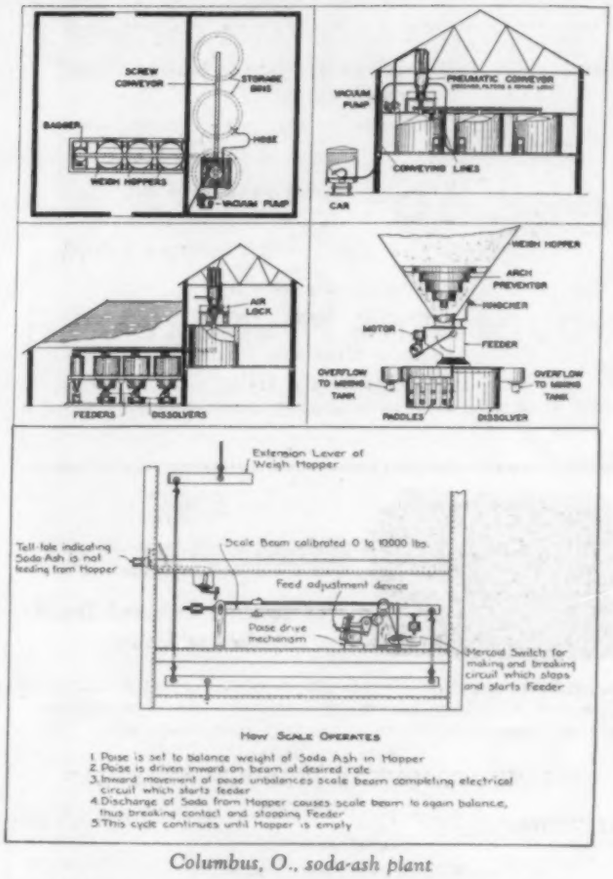
The average amount of water softened and filtered per day during the year was 29.6 million gallons. The hardness was reduced from an average of 262 ppm to an average of 85 ppm. There were used 2,994 tons of soda ash and 7,194 tons of lime; costing $23.73 per ton for soda ash and $4.03 for lime. The cost of lime, soda ash, alum, chlorine and coke totaled $10.24 per million gallons of water treated.

The amounts used of each material, in pounds per million gallons, averaged for each month of 1932, were as follows:

Month of 1932	Sulphate of Alumina	Lime	Soda Ash	Liquid Chlorine
January	615	974	300	1.3
February	358	1245	415	1.1
March	329	1315	558	1.2
April	274	1315	486	1.3
May	72	1386	515	1.6
June	72	1444	486	1.2
July	72	1344	529	2.0
August	57	1386	515	1.7
September	43	1386	572	1.2
October	57	1460	615	1.0
November	72	1460	800	0.9
December	143	1256	900	1.0
Average	186	1330	558	1.3

Arrangements were installed last winter for unloading, storing and applying soda-ash to the water. In future, soda-ash will be received in bulk in carload lots and will be unloaded by means of a vacuum system having a capacity of 5 tons per hour. The installation consists principally of: vacuum pump, conveying line with intake nozzle, receiving or collecting station, and air filters. The pump produces a vacuum through the filters, receiver and conveying line. The nozzle of the conveying line is inserted into the soda-ash and the high velocity of air carries the material up approximately 35 feet into the receiver or collecting system. On entering the receiver from the conveying line, the velocity of flow is suddenly reduced and the soda-ash drops to the bottom of the receiver and is discharged through a rotary lock into a screw conveyor which has four outlets, three of which distribute the soda-ash to weigh hoppers and one to a bagger. The air is passed through cloth filters for the removal of dust in suspension and then exhausted.

The three storage bins hold approximately 50 tons of soda-ash and the weigh hoppers hold 5 tons each. Access doors have been provided in the storage bins, and suitable connections provided so that the stored soda-ash may be removed and elevated into the receiver or


SCREW CONVEYOR
STORAGE BINS
BAGGER
HOSE
WEIGH HOPPERS
VACUUM PUMP
PNEUMATIC CONVEYOR
VACUUM PUMP
CONVEYING LINES
CAR
AIR LOCK
FEEDERS
DISSOLVERS
WEIGH HOPPER
ARCH PREVENTOR
KNOCKER
MOTOR
FEEDER
OVERFLOW TO MIXING TANK
OVERFLOW TO MIXING TANK
PADDLES
DISSOLVER
Extension Lever of Weigh Hopper
Tell-tale indicating Soda Ash is not feeding from Hopper
Scale Beam calibrated 0 to 10000 lbs.
Feed adjustment device
Poise drive mechanism
Mercoid Switch for making and breaking circuit which stops and starts Feeder
How Scale Operates
1. Poise is set to balance weight of Soda Ash in Hopper
2. Poise is driven inward on beam at desired rate
3. Inward movement of poise unbalances scale beam completing electrical circuit which starts feeder
4. Discharge of Soda from Hopper causes scale beam to again balance, thus breaking contact and stopping Feeder
5. This cycle continues until Hopper is empty

Columbus, O., soda-ash plant

collecting station by the vacuum system and from there transported by conveyors to the weigh hoppers.

On account of the small storage space available for bulk soda-ash, arrangements have been made to bag and store the surplus as formerly.

A motor-driven feeder is bolted to the bottom of each hopper and both hopper and feeder are supported by weigh levers. The weigh levers are connected to a weigh beam which is calibrated from 0 to 10,000 lbs. in 2 lb. graduations. When the hopper is filled with soda-ash, the poise on the weigh beam is moved manually to the point where it indicates the weight of material in the hopper. When the machine is put into operation the poise is driven inward on the beam mechanically at the rate at which it is desired to feed soda-ash. This rate is adjustable between 0 and 2500 lbs. per hour. As the poise is driven inward, the scale beam becomes unbalanced and raises at its outward end. The movement of the weigh beam completes an electrical circuit which starts the feeder motor. Material is then fed out of the hopper until the weigh beam is again balanced and the feeder motor circuit is broken. This cycle of operation is kept up until the hopper is empty.

The soda-ash is fed from the hoppers into dissolvers which have motor-driven paddles. A mixture of water and steam flows through the dissolver all the time it is in service, dissolving the soda-ash and carrying it into the baffled mixing chamber under the floor of the chemical storage house.

The plant was designed in the water division of the city. The Downing & Hetrick Co., Columbus, Ohio, were the general contractors. The unloading equipment was furnished by the Dust Recovering & Conveying Co., Cleveland, Ohio, and the chemical feeding devices by the French Oil Mill Machinery Co., Piqua, Ohio.

STREET, SEWER AND WATER CASTINGS

Made of wear-resisting chilled iron in various styles, sizes and weights.

MANHOLE COVERS
WATER METER COVERS
ADJUSTABLE CURB INLETS
GUTTER CROSSING PLATES
VALVE AND LAMPHOLE COVERS

Write for Catalog and Prices

SOUTH BEND FOUNDRY CO.

All Kinds of Gray Iron Castings

SOUTH BEND, IND.

QUINN
"HEAVY DUTY"
PIPE FORMS HAND OR WET PROCESS

Make concrete pipe on the job with QUINN Heavy Duty Pipe Forms. Give more employment AT HOME where it is needed. . . . Quinn forms are standard in every respect, assures more uniform concrete pipe of highest quality—by our experience of 25 years in the manufacture of Concrete Pipe Equipment.

Sizes 12" to 84"—any length
Tongue and Groove or Bell End.

Write for Prices and Catalog

VALUABLE BOOK FREE

QUINN WIRE & IRON WORKS
1621 Twelfth St. Boone, Iowa, U. S. A.

USE MINERALEAD

For Jointing Bell and Spigot Water Mains

Easy handling, ingot form—Impervious to moisture—Absolute uniformity—Easy melting—Rapid pouring—No caulking—Less initial leakage—Bell holes unnecessary—A saving in cost of material and labor.

Write for Catalog

THE ATLAS MINERAL PRODUCTS COMPANY
of Pennsylvania
MERTZTOWN PENNSYLVANIA
Established 1892

G-K Sewer Joint Compound

Safety First
BUILD WITH STEEL CASTINGS

Manhole Covers
Catch Basin Grates
Curb Inlets

Monument Boxes
Manhole Steps
and other Steel Castings

RUBBERIZED COVER

Westeel Highway and Street Cushioned Steel Castings for Noiselessness, Durability and Strength

We welcome an opportunity to quote on your requirements.

THE WEST STEEL CASTING CO.
CLEVELAND, OHIO

ON MY WAY TO NEW YORK AND THE PICCADILLY

. . best hotel I know! Near everything, just 200 feet from Broadway. Modern, hospitable, and comfortable. Like the Manager, like the rates—$2.50 single, $3.50 double, for a room with bath!

THE HOTEL -
PICCADILLY
45th St. • W. of Broadway • New York
WILLIAM MADLUNG, Mng. Dir.

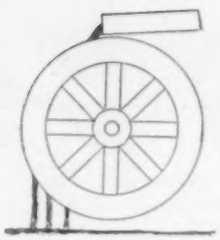
Keeping the Lead in
MILWAUKEE, WIS.

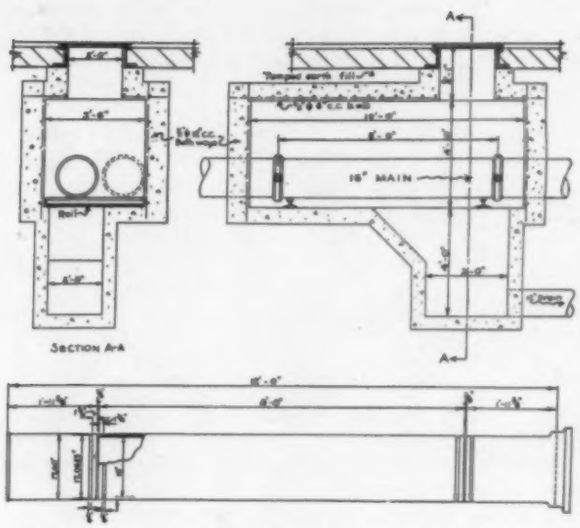
New
• $200,000.00 Improvements
•
Now Under New Management
•
Famous Food in the Coffee Shop
BREAKFAST....25¢
LUNCHEON.....35¢
DINNER..65¢ *Upward*
•
300 ROOMS
ALL WITH BATH $2 UP

PLANKINTON HOTEL

THE WATER WHEEL

FOLLOWING are the essential features of the important article of the month having to do with water works design, construction and operation and water purification, arranged in easy reference form and condensed and interpreted. Published every month to include articles appearing during the preceding month.





Pipe cleaning pit on 16-inch main. Below, removable section of pipe in pit (see "Cleaning a 16-inch main")

PURCHASING land for the new water works reservoir at Springfield, Ill.[33], was attempted by direct bargaining with the owners, the price per acre to be determined on the basis of its value as farm land. It was proposed that a soil survey be made to determine the fertility of each holding, which would be taken as the basis of its fundamental value; which value would be modified to allow for the proximity of the tract to paved roads or to the city. To this would be added the value of all improvements and any severance damages or going concern value. Over two-thirds of the land to be acquired was thus surveyed and evaluated with the result that the value set always seemed right for the other fellow's land but only in rare cases did the value placed on a tract suit its owner. Therefore this method of bargaining was soon abandoned and the land acquired by individual negotiations, with condemnation suits in a few cases.

"The holding company"[30] has made a place for itself in the economic life of the country and in particular in the development of its huge public utility industry. . . . It is from the powerful utility groups that the initiative for an adaptive policy has emanated. The controlling interests of some of these groups have united all the operating companies in each state under a state holding company. . . .

"The creation of state operating companies may be considered a forward step in the decentralization of the operation of the properties controlled by holding companies. Highly competent men would be placed in actual charge in the state and would thus be brought in most direct and closest contact with the public served by the companies under their supervision. They would engage for their staffs a large number of local experts as liaison officers who best understand local conditions, and can most intelligently interpret the workings of the enterprise to the consumer and make for greater public confidence. These intimate relations would enable the state companies to place large amounts of their security issues locally, which would intensify the interest of the local communities in these companies and in turn put the managers of the utilities on their mettle as to most efficient operation of the properties. And, above all, it would be possible to place all the activities of the companies under the supervision and regulatory powers of the state authorities."

Hydrant and valve maintenance was discussed by several members of the N. E. W. W. A. at a meeting this year. Mr. Anthony made a plea for standardized methods of painting to indicate hydrant capacity[1], and Mr. Smith described how capacity tests were made[2]; Mr. Mowry discussed the importance of regular inspection of gate valves and told how it is done in several cities, while Mr. Finneran described how valves are maintained in Boston.

The Maine Water Utilities Ass'n recommends painting all hydrant barrels orange, with green tops and nozzle caps if the hydrant can supply pumpers with 1,000 gpm or more, orange if with 500 to 1,000 gpm, and red if the capacity is under 500. Last year the Portland Water Dist.[2] tested 750 hydrants in its system and found 406 in the green class, 225 in the orange and 119 in the red. In one district 86% were green, in another 100% were red; these being the two extremes.

In Boston a special crew of two men, with a chauffeur and an auto truck spend their entire time for nine months of the year inspecting and repairing the 26,000 gate valves[4].

Cleaning a 16-in. main once every six months at Pocantico, N. Y., reduced the pumping cost alone by $4,800 a year[12]. With periodic cleaning of this 7-mile stretch of pipe, it was economy to provide for easy access to the pipe for introducing and removing the cleaning machine, and for this purpose the pipe cleaning pit shown in the illustration was used. An 8-foot length of the c.i. pipe was cut out and rolled to one side of the pit during cleaning; after which it was rolled back to place and joined to the line with standard Victaulic couplings. The waste water with the dirt, etc., from the main was discharged into a pit and then through a 12-inch drain pipe to a near-by culvert. With this arrangement, the seven miles of mains can be cleaned in three hours, and the main is out of service, including test of the coefficient, about five hours total.

In addition to the lowered cost of pumping, the capacity is increased about 35% and the necessity for a large capital expenditure is deferred.

Water consumption in England is generally stated to be less than in the United States. But **Caleb Mills Saville** gives figures[34] which "indicate that the actual use of water in houses is not so much a matter of requirement as of custom and facility in obtaining it. The per cap-

ita use in both English and American houses for similar conditions is substantially the same, although the tendency toward houses equipped with more modern plumbing appliances seems greater in American practice."

He also makes comparison of annual water rents at Sheffield, England, and Hartford, Conn. In the former the net annual water rents per house of five different types of houses varied from $39.41 to $53.76, or from 29 cts. to 51cts. per 1,000 U. S. gallons; while in Hartford the water rents in five similar houses varied from $4.08 to $36.44, or 20 cts. per 1,000 gallons.

Disinfecting newly installed mains is becoming standard practice in the more progressive cities[14]. Since 1929 Hartford, Conn., has used hypochlorite powder or chlorine gas. Ordinarily they place about 0.5 lb. of H. T. H. in every sixth or eighth length of pipe as laid; then, when the line is completed, water is admitted slowly, the mains held full for a half hour or so and then thoroughly flushed out. If a long time will elapse between laying the pipe and filling it, chlorine gas is injected with a W & T portable chlorinator. In addition to this, during construction a strong solution of H. T. H. was sprayed onto the entire inner surface of the pipe by means of a flit gun, by a man who crawled into the pipe.

New Haven recently laid 4¼ miles of 48-in. pipe and sterilized the entire length by adding chlorine at one end until there was 0.1 p.p.m. at the other end. Another line had been flooded from a broken sewer, but after chlorinating showed bacteria counts under 30 per c.c. at 37°C with no gas formers in 10-cc samples. A W & T emergency direct feed panel with an injector was used for the long lines, but shorter lengths with injector panel only is recommended.

Treatment of London's supply is very apparently kept up to date, according to the latest report of Sir Alexander Houston[19]. The only Thames waters not chlorinated are those treated at Chelsea and Lambeth. The chlorine doses vary from 0.2 to 0.3 ppm and 0.1 ppm of ammonia is used to prevent tastes. Water treated at Kempton Park and Walton is subjected to storage, filtration at 145 British gallons per sq. ft. per hour without coagulation, followed by filtration at 3.73 gal. per sq. ft. per hr., the former effecting considerable chemical change; the latter, striking bacterial removal.

At the Barn Elms works a 5,120 g.h.p. ozone plant reduced the bacteria 82% from 97 per cc. and removed all B. coli. It "has considerable power in reducing and removing tastes." (It is reported that Paris has definitely decided on ozonizing 60 mgd.)

Bibliography of Recent Water Works Literature

c indicates construction article; *n*, note or short article; *t*, technical article.

Journal, New England Water Works Association, June.

1. Standardization of Hydrant Markings. By Sidney S. Anthony, pp. 103-106.
2. Hydrant Pressure and Flowage Tests at Portland, Me. By Leavitt R. Smith, pp. 107-110.
3. Inspection and Maintenance of Gate Valves. By C. W. Mowry, pp. 111-114.
4. Maintenance of Gate Valves in Boston. By George H. Finneran, pp. 115-121.
5. Joint Leakage Tests on 16" Ball and Socket Pipe at Haverhill, Mass. By Herbert C. Crowell, pp. 122-123.
6. Historical Notes on a Line of 10" Cast Iron Pipe Laid in 1854. Pennichuck Water Works, Nashua, N. H. By D. C. Calderwood, pp. 124-128.
7. Field Tests of Large Meters. By Nelson Boardman, pp. 129-130.
8. Some Electrical Kinks in Water Works Practice. By J. H. Read, pp. 131-132.
9. Construction of the Cobble Mountain Diversion Tunnel. By Harry H. Hatch, pp. 133-152.
10. New England's Classic Contributions to Hydraulic Science. By Charles W. Sherman, pp. 153-163.
11. The Great Storm of September 16 and 17, 1932. By George V. White, pp. 164-183.
12. Experiences with Water Main Cleaning. By Arthur T. Clark, pp. 184-189.
13. Fire Protection Classification. By George W. Booth, pp. 190-194.
14. Disinfection of Water Mains. Round Table Discussion, pp. 195-199.
15. Use of Unemployed and Relief Undertakings on Water Works. Round Table Discussion, p. 200.
16. The Way Out. By E. Sherman Chase, pp. 207-208.

The Surveyor and Municipal and County Engineer, May 19.

17. Purification of River Water. Excess Lime Treatment, p. 524.

May 26

18. Salisbury Water Supply, p. 555.

June 2

19. Treatment of London's Water, p. 570.

June 9

20. Features of Construction of the Ryburn Dam, p. 603.

June 16

21. Rural Water Supplies. By T. Marsland, pp. 623-625.
22. Wymondham Water and Sewerage Schemes, p. 626.

The Canadian Engineer, May 23.

23. Low-Cost Water Supply System Installed at Stirling, Ont. By D. H. Fleming, pp. 15-17.
24. Universal Cast-Iron Water Pipe. By B. H. Lewis, pp. 18-19.
25. Responsibilities of a Water Commissioner. By G. S. Matthews, pp. 22-23.

May 30

26. Zeolite Water Softening Plant at Etobicoke Township Water Works. By W. H. Walker, pp. 9-14.
27. Hamilton Purification Plant Opened, pp. 15-16.

The Earth Mover, June.

28. c. Dam Construction at the Illinois Capital, pp. 12-15.

Water Works Engineering, May 31.

29. Who Should Pay for Water Main Extensions in New Sections? By J. E. Gibson, pp. 472-474.
30. Chicago Water Supply System. By Loran D. Gayton, pp. 475-477.
31. Factor of Safety in a Water Works System. By Wm. W. Brush, pp. 478-480.
32. Pension and Insurance for Water Works Employees. By Ross L. Dobbin, pp. 481-482.
33. Financing the Springfield, Ill., Water Plant. By Robert E. McDonnell, pp. 483-485.
34. Comparison Between English and American Waste and Consumption. By Caleb Mills Saville, pp. 486-490.
35. Hetch Ketchy Coast Range Tunnel and Bay Crossing. By M. M. O'Shaughnessy, pp. 530-531.
36. Treatment of Water to Increase Palatability. By J. T. Campbell, p. 553.

June 14

37. Training Men for Water Service. By Jack J. Himman, pp. 582-585.
38. When Good Water Becomes Bad. By Nathan N. Wolpert, pp. 586-589.
39. State Holding-Operating Units. By V. Bernard Siems, pp. 590-592.

Water Works and Sewerage, June.

40. Water Supply in Relation to City and Regional Planning. By Malcolm Pirnie, pp. 189-191.
41. Hydrant Maintenance. By E. T. Crouch, pp. 197-199.
42. Safe and Adequate Water Supplies for Oil Refinery Uses. By Sheppard T. Powell, pp. 211-215.
43. The Evaluation of Activated Carbon. By John R. Baylis, pp. 220-224.
44. Organic Iron and Color Removal Facilitated by Use of Permanganate. By Thomas R. McCrea, pp. 225-226.

American City, June.

45. Developments and Improvements in a Borough Water Supply. By J. A. Carr, pp. 41-43.
46. Unemployed Labor Used to Increase Water Supply in Bristol, Conn. By Carleton W. Buell, pp. 46-48.
47. The Place of Powdered Activated Carbon in Water Purification. By F. E. Stuart, pp. 49-50.
48. Pumps and Their Places. L. R. Douglass, pp. 62-64.
49. Study of the Water Supply of Staunton, Va. By Richard H. Catlett, pp. 65-67.

Engineering News-Record, June 8.

50. Chicago's Water Works—A Century of Accomplishment. By Arthur E. Gorman, pp. 733-737.
51. Progress in Intake Design Revealed by Chicago Cribs. By Myron B. Reynolds, pp. 737-739.
52. Advance in Pre-Treatment Aids Water Purification. By N. T. Veatch, pp. 740-742.
53. A Decade of Advance in Knowledge of Filtration. By J. W. Ellms, pp. 742-745.
54. Control of Odors Marks Progress in Sterilization. By George D. Norcom, pp. 745-747.
55. Water Softening Practice Shows Rapid Growth. By Chas. H. Spaulding, pp. 747-748.
56. New "Standard Methods" Shows Growth of Science. By Harry E. Jordan, pp. 748-749.
57. Notable Improvements in Groundwater Development. By O. E. Meinzer, pp. 750-752.
58. Chicago to Build 30 MGD Pumping Plant. By Loran D. Gayton, pp. 752-754.
59. Equipment Progress Aids Pumping and Distribution. By Theodore A. Leisen, pp. 754-756.

June 15

60. Handling 2,000,000 Cu. Yds. of Excavation at Boulder Dam, pp. 776-780.

June 22

61. Water Treatment Costs Analyzed for Savings, p. 810.
62. Interest at A. W. W. A. Meeting Centers on Recovery Program, p. 811.

The Mines Magazine, April.

63. Dimensional Homogeneity Applied to the Standard Orifice. By Harold W. Gardner, pp. 5-7.

Many Streets Are Now in Need of Maintenance or Resurfacing

Maintenance Equipment: Its Suitability and Utility—II

By C. N. Conner

4—Maintaining Bituminous Treated Roads

The most common type of equipment for cleaning road surfaces is the rotary sweeper broom, which is drawn by either truck or horses. In one state the broom is mounted on the rear of trucks. Also blowers mounted on trucks or on the rear of Fordsons are used to blow off fine dust. Virginia uses a combined rotary broom and blower attached to a Fordson which is probably one of the most efficient cleaning units in use. The broom removes any heavy layer of dust, and the blower takes off the fine film of dust, thus insuring a good penetration of prime coat material.

Unloading Aggregate by hand, shoveling directly from cars to truck, is not economical. In some places home-made hoppers are hung onto the side of a railroad car and the stone is shoveled into them and from them dumped directly into trucks, thus eliminating truck tie-ups. Aggregate is often shipped in hopper cars from which stone is dumped underneath and loaded into trucks by means of belt conveyor. It is often placed in stock piles from which it is loaded into trucks by means of both bucket and belt conveyors.

Spreading Aggregate over bituminous treatments is commonly performed by: Spreading directly from the tail gate of truck, adjusting the size of opening by means of chains; or by stone spreaders attached to the rear of truck, such as the aggregate spreader, utility spreader, Little Sandy, and revolving disc spreaders. The Big Sandy holds about five tons and in filling it trucks are backed upon a ramp and dump aggregate into the spreader, which is then driven over the treatment and spreads stone at the required rate of application. The Burch spreader is used to spread stone to a specified depth.

Most of these machines are designed to spread stone at sufficient width so that the wheels of the truck will not pick up the bituminous material. However, considerable improvement can be made along these lines, as several of these machines will still pick up hot application bitumen when spreading aggregate.

Distributors.—Two distinct types of distributors are used, the air distributor, and the pump distributor, some of which have power take-off on the truck while others have separate motor units. Where long hauls are involved, the use of tanks mounted on trailers or tank supply trucks is advantageous.

For heating materials, portable boilers are necessary. There is a demand for high-pressure boilers which are small, requiring little water, and are easily transferred from point to point.

Drags.—Both long- and short-base steel and wooden drags have been used to good advantage on treatment work, as have broom drags on certain types of work such as sand treatments and hot application work, where it is desired to distribute the loose material uniformely over the road surface.

Rollers.—Where the surface treatments have been dragged it is advisable to roll them with five to eight-ton roller.

Mixing Equipment.—A tractor and road grader unit, one-man graders and certain types of maintainer are all effective for mixing the aggregate and bitumen on the surface of the road.

Some suggestions relative to equipment for this type of surfacing are offered below.

A sheet metal shield over a rotary broom will greatly reduce the difficulty from dust. A light sprinkling will reduce it still more.

In using standard distributors for bituminous surface materials, auxiliary feeder tanks are economical, as the same number of distributors can do a greater amount of work per day. The auxiliary tank can also be used for many other purposes.

A demountable distributor unit for attachment to bituminous tank trucks and trailers is reported very successful. The excessive axle loads of a distributor of more than 800 gallons mounted on a four-wheel truck can be eliminated by using a six-wheel truck or an auxiliary axle which converts a four-wheel truck to a six-wheel one.

Equipment for cutting or honing down waves in treated surfaces is largely home-made. Graders and roller scarifiers with hone attached have been used with considerable success, as has a heavy disc machine.

Heating coils and auxiliary booster coils for rapid and uniform heating of bituminous materials are satisfactory in most cases; but there is a need for a means of reducing the time required.

Satisfactory mixers for bituminous materials are available, but there is a demand for a small-capacity portable asphalt plant.

5—Maintaintng Pavements

The need for better maintenance on city pavements and suburban roads is growing daily; money invested in them is being wasted because of neglected maintenance.

Center-line marking machines for white and yellow paints are satisfactory, except for their speed. There is need of a machine that can handle tar and asphaltic paints more readily; also for more durable and quicker drying paints.

Small compressors are used for cleaning cracks and pots for pouring. Several crack-pouring machines have proven satisfactory.

Until recently, a real demand existed for equipment for bringing sunken slabs back to their proper position; jacks and blocks were not satisfactory and were frequently very expensive. In 1931, a number of machines known as "mud jacks" were used to pump mud under the sunken slabs to raise them to the proper elevation. In one state, where these machines were used for only the most difficult cases, the cost averaged only 38.7c per square yard. Several states now use them regularly for this work and in superelevating curves, finding them more economical than the old methods.

Heating old bituminous surfaces in resurfacing is too expensive for rural roads but highly satisfactory on city streets. Several types of surface heaters are available.

The use of drop hammers for breaking up large areas of pavement, and pneumatic equipment for small areas and for trenching, are recommended.

Grinding or cutting down of high spots in pavements is being successfully done with electric and mechanical grinders or pneumatic tools.

Concrete patching is done largely by mixing concrete on the job, but custom-mixed concrete delivered in the sellers' equipment is not unusual.

There is practically no standardization in barricade design, but such is desirable.

The use of batching or weighing devices for mixers used in maintenance is desirable, and there is need for a simple, rugged, and portable device for this purpose.

Equipment Used by a State Highway Department

To illustrate the great extent to which our entire system of maintenance is built around the use of adequate equipment, partial lists of that in service in October, 1932 in one typical state highway department are here submitted. This state highway system includes 1,646 miles of primary roads, 5,576 of secondary, 2,235 of supplementary, and 436 of other roads; a total of 9,893 miles, which cost $222,408,307.

Trucks.—The state owns and operates four ½ ton, five 1-ton, 356 1½-ton, 44 2-ton, one 2½-ton, 61 3-ton, 23 3½-ton, 4 4-ton and one 5-ton; a total of 499 of 14 different makes; plus 7 station wagons. Of these, 16 are assigned to the headquarters garage and used on special work, 47 to survey parties and farm-to-market construction crews, and 443 to road maintenance.

Tractors.—The department has in service 446 tractors of nine makes used on farm-to-market construction and general maintenance.

Motorcycles.—Nineteen motorcycles of three makes are assigned to the highway patrol and weight officers.

Graders.—The Maintenance and Construction Bureaus use equipment of various styles which may be classified under the general head of graders, including 82 "graders," 245 "motor grader attachments," 42 "leaning wheels," 13 "maintainers," 12 "planers," 8 "scrapers," 3 "scarifiers," and 28 miscellaneous designations; a total of 439 pieces of equipment of this class by 17 different makers.

Miscellaneous equipment used in the maintenance of highways and bridges includes 22 air compressors, 14 loadometers, 13 plows, 11 crushers, 10 loaders, 9 rotary pumps, 8 rollers, 7 mowers, 6 mud jacks, 5 double-drum hoists, and 45 other pieces of miscellaneous equipment—sand blast outfits, gravel plants, mixers, cranes, paint machines, road magnets, etc.

Safe Water from Wells and Concrete Reservoirs

Some idea of current thought and practice regarding treatment of ground water supplies has been obtained by the Bureau of Sanitary Engineering of the Texas State Department of Health (V. M. Ehlers, director) by means of inquiries submitted to a number of state sanitary engineers and consulting engineers.

Three questions were asked: 1—Is chlorination of all ground water supplies necessary? 2—Can water wells be drilled which will produce a safe water? 3—Can concrete reservoirs be constructed so as to be leak proof?

To No. 1, replies were received from Arizona, Kansas, Louisiana, New Mexico, New York and Oklahoma. All agreed that it was "unnecessary," "inexpedient," "not warranted" or not advisable to issue a blanket order or recommendation for chlorinating all ground water supplies. This endorses the policy of the Texas bureau to consider each supply a separate problem.

To No. 2, the state water geologist of North Dakota, the U. S. Geological Survey, Jack J. Hinman, Jr., and the American Ass'n of Water Well Drillers all replied that it is perfectly feasible to drill wells which will yield safe water for "an indefinitely long period" if "over 30 or 40 feet deep," and if "standard methods of drilling and proper precautions" are employed.

To No. 3, three Texas consulting engineers replied as follows: H. L. Thackwell, Tyler; "Yes." H. E. Elrod, Houston; "Entirely possible and comparatively easy." Montgomery & Ward, Wichita Falls; "Unquestionably, if properly designed and constructed."

ASPHALTS

***for* ROOFS *and* ROADS**

Road Oils and Cut-backs

All made from selected
SMACKOVER (Arkansas) CRUDE

Physical properties and quality equal to the best Mexican Asphalts

Quotations furnished in drums or insulated tank cars.

MACMILLAN PETROLEUM CORP.
El Dorado, Arkansas

Hotstuf
TRADE MARK

CONTRACTORS EQUIPMENT
Asphalt Heaters
Surface Heaters
Paving Tool Heaters and Tools
Hi-Speed Trailer Tool Boxes
DISTRIBUTORS IN PRINCIPAL CITIES
MOHAWK ASPHALT HEATER CO.
FRANKFORT NEW YORK

LET THE
GENERAL
AND HIS STAFF
SHOVEL - DRAGLINE - PULLSHOVEL - CLAMSHELL - CRANE - SKIMMER
Make your SPRING DRIVE *a success!*
The BIG MACHINE! of its class.
Speed? Yardage? Service? Yes! and plenty of it.
Write for further information or a demonstration.
Distributors in principal cities
THE GENERAL EXCAVATOR COMPANY
MARION, OHIO, U.S.A.

BUFFALO SPRINGFIELD
ROLLERS

Ruggedness of design is the basic reason for the reliability of BUFFALO-SPRINGFIELD rollers.

TANDEM AND THREE-WHEEL

THE BUFFALO - SPRINGFIELD ROLLER CO.
SPRINGFIELD, OHIO

Buffalo Springfield

Largest and Finest Rooms IN CLEVELAND

THE ONLY NEW HOTEL IN CLEVELAND

FEATURING 150 Rooms $2.50 SINGLE WITH BATH

150 *Rooms at* $3.
150 *Rooms at* $3.50
FOR TWO PERSONS
$4. — $5. — $5.50

■ Acclaimed by hotel experts everywhere as the ultimate in comfort and luxury – the new Carter Hotel offers you Cleveland's greatest hotel value.

■ New – from the smallest article in any of its 600 rooms to the ideals and spirit which govern this newly opened castle of comfort and luxury.

■ Finest food from all electric kitchens. Low rates. Unusual Coffee Shop. Dining and dancing nightly in season in the famous Rainbow Room. 2000 car garage in connection.

CARTER HOTEL

Folsom B. Taylor
Managing Director

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54

Grading Concrete Aggregates in Los Angeles

A study was completed in 1932 by the Bureau of Engineering of Los Angeles of the strength of concrete pavement completed during the calendar years 1929, 1930 and 1931, and the results were analyzed to determine the effectiveness of the various methods of proportioning and placing concrete which have been used during these years.

The average of all concrete core strengths for concrete pavements on large contracts, where measuring of aggregates was by weight, was as follows:

1929—3630 pounds per sq. inch
1930—3960 pounds per sq. inch (increase of 9.1% over 1929)
1931—4320 pounds per sq. inch (increase of 19.0% over 1929)

The steady improvement has not resulted from an increase in cement strength nor the use of more cement in the mix, but largely from the improvement in methods of grading concrete aggregate to an "ideal" grading of maximum density in order to obtain concrete of the required workability with a minimum amount of mixing water. In October, 1929, a start was made in having rock delivered in 3 sizes—pea gravel, medium and coarse in order that it might be combined to the "ideal" grading, rather than securing rock from the producer of supposedly specification grading. Late in 1930 the refinements were extended to include varying the proportion between sand and rock (but not affecting the yield of cement) with the idea of obtaining an "ideal" grading of the combined fine and coarse aggregate. Four ideal mixes were developed to conform with varying conditions of placing the concrete. This method of proportioning is termed "variable."

The following table shows the strength of concrete, expressed as the ratio between 28-day compressive strength of concrete and the cement tested as mortar. This ratio eliminates the variations in concrete strength which are due to changes in cement strength. The results are segregated for three methods of proportioning and three methods of placing:

Proportions of Sand to Rock

METHOD	*Variable* No. of Projects	Ratio	*Fixed Rock in three separate piles* No. of Projects	Ratio	*Fixed Rock in one pile* No. of Projects	Ratio	*Weighted average of ratio*
Machine tamper	2	1.32	0	..	0	..	1.32
Tamping templet	5	1.31	12	1.10	26	1.03	1.08
Hand float only	1	1.15	2	1.09	4	1.16	1.15
Weighted Average	..	1.31	..	1.10	..	1.04	..

The results of this analysis show clearly the advantages of the use of the variable proportioned concrete (ideal grading of combined sand and rock) over the other methods. An increase of 25.9% in strength was obtained by this method over methods in use in 1929, and the improvement was accomplished without affecting the cement yield and with no increase in the cost of the pavement. The use of this method will be extended in the future as far as practicable on the larger projects.

The most important development in the city's construction practices is the introduction of transit-mixed concrete or concrete which is mixed while in transit from the bunkers to the job by means of a revolving drum mounted on the truck and operated by a separate power unit. An improved product at no increase in the cost can be obtained due to the fact that a more scientific proportioning of the concrete aggregate is possible at the large bunkers from which these trucks operate than is possible under ordinary conditions with the concrete mixer on the street. This method is permitting an extension of the use of the variable proportioned concrete which was described above. The use of transit-mixed concrete has obvious advantages in congested areas of the city where the presence of a concrete mixer would interfere with traffic conditions or be otherwise inconvenient.

Record in Concrete Pavement Laying—1807 sq. yd. in Ten Hours

Setting Blaw-Knox Road Forms

One man operates concrete spreader bucket. Note evenness of spreading.

WHAT is believed to be a record in laying concrete pavement was accomplished on May 2, 1933, by Vincent Schiavi, of Buffalo, N. Y., on Delaware State Highway Contract No. 300. Working out of a central mix station at Wilmington, Del., approximately five miles from the work, Mr. Schiavi's crew laid a 1626 foot strip of concrete 8 inches deep and 10 feet wide, in a ten-hour working day. No special effort was made to set a record.

This contract is part of the "Dual Road," a three-lane highway paralleling the existing four-lane du Pont Highway between Wilmington and Dover, a distance of 48 miles, and separated from it by a 30-foot grass plot. When the new road is finished it will carry the north-bound traffic while the present four lanes will carry the south-bound. That part of the new construction under contract to Mr. Schiava is 1.79 miles between Farmhurst and School House Lane which is being laid in three sections of 10, 11 and 10 feet respectively. The specifications call for 7,950 cubic yards of Warner Company's Central Mix concrete, pebble aggregate (incidentally, this is the first state highway project using pebble aggregate in place of crushed stone aggregate), which is conveyed from the mixing plant at Wilmington to the construction work in a fleet of trucks equipped with Blaw-Knox open-top agitator bodies.

On the construction job the contractor is using Blaw-Knox road forms, a 1⅛ cubic yard Blaw-Knox concrete bucket, and a Blaw-Knox Ord Finisher, with which equipment he is unloading, spreading and finishing at the astonishing rate of a truckload of mix every three minutes.

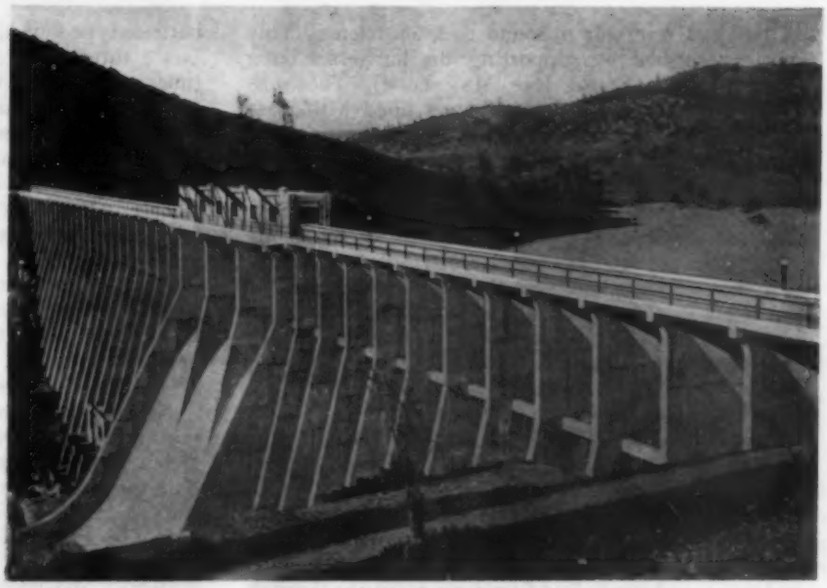


FIG. 1. *Stony Gorge Dam, Orland Irrigation Project, Cal. U. S. Bureau of Reclamation*

By Dirk A. Dedel
Hydraulic Engineer

Articulated Buttress Type Dams for Municipal Water Supply Projects

IMPROVEMENTS in dams which materially lower the cost of water supply projects and at the same time offer increased safety against failure are of especial interest, under existing financial conditions, to public works officials. Safety, of course, is the paramount consideration in all dam design and construction. Owing to the important relation that they bear to lives and property and to the value of the water supply they impound, dams constructed for municipal water supply projects should have even a greater margin of safety than that which ordinarily is considered satisfactory for other types of hydraulic projects.

Conservatism dictates that improved types of dams for important projects should consist of structural elements which have been tried and tested individually in actual dam construction. This principle has been the basis of designs for articulated or Ambursen dams for municipal water supply projects.

The structural elements of the standard Ambursen dam, which consist of a series of simply supported reinforced concrete deck slabs resting on corbels or haunches adjacent to the upstream faces of triangular buttresses, have been used successfully for over thirty years for municipal projects. It may be concluded, therefore, that modified types, consisting of the same basic elements designed for certain difficult conditions now frequently encountered, will also give successful performances. In view of the recent strong trend toward the use of the buttress type dam, a review of basic principles and the aforementioned modified designs resulting from these principles will be timely.

Recent Trends in Buttress Dam Design

One factor that has influenced the selection of the articulated buttress type dam for municipal projects has been the reluctance of many engineers to depart from the use of the conventional gravity type of dam for important projects, due to the age-old precedent in use of this type. Precedent in this instance is wrong for poor foundations that are being more frequently encountered today. No engineer would design or permit the use of a structure of any other kind having as low and indeterminate a factor of safety as the gravity dam. Disastrous gravity dam failures such as the collapse of dams at Austin, Pa., in which 100 lives were lost; Austin, Texas, in which 8 lives were lost, and the very recent St. Francis dam failure in California which cost 500 lives, have been the inevitable result of this policy, forced upon the profession by the prohibitive cost of building a gravity dam with a nominal safety factor greater than 1½ or 2. The outcome of these failures has been that engineers are now re-examining both designing and construction practices, as good dam sites having sound rock foundations are becoming increasingly scarce. The result is that the merits of the articulated buttress dam are gaining increasing recognition throughout the world.

Examples of this trend toward the use of improved types are the 250-foot high Rodriguez dam now under construction at Tijuana, Mexico, for the Mexican Government, and the 140-foot high Stony Gorge dam near Orland, California, which was constructed for the U. S. Bureau of Reclamation in 1928. Both of these dams were constructed on foundations which contained faults and which might subject the structure to slight differential movements. For this reason the articulated, slab-and-buttress or Ambursen type of dam was selected by the respective government engineers for each project.

At the Rodriguez dam, a large water supply and irrigation project, the faulted and broken rock portion of the foundation occurs where the dam attains its maximum height of 250 feet. This area of poor foundation material is about 100 feet wide and runs parallel to the river bed throughout the length of the dam. As the broken rock and faulted area did not offer a suitable foundation for the buttresses, it was necessary to devise a foundation structure that would span the unsatisfactory material and carry the entire load from

the dam and reservoir to sound rock abutments. This was accomplished by supporting the buttresses on a monolithic arch barrel (see May issue). The sub-intradosal space below this arch was filled with mass concrete in order to utilize as much of the bearing value of the broken rock as possible. No dependence was placed on this area, however, as the arch barrel was proportioned, with conservative stresses, to take the entire load from the dam above. In the case of the Stony Gorge dam the Reclamation Bureau felt that, as the fault was a very narrow one, the flexible nature of the dam itself would permit safe adjustment to any fault movement that could be expected, with little damage to the structure and without danger to lives or property below.

Fundamental Principles

The rapid adoption of the buttress dam for important projects has resulted from a more thorough understanding of the manner in which the maximum stresses are distributed through the dam. Actually, correctly proportioned buttresses result from a distribution of the concrete in such a way that the maximum inclined stresses are substantially of uniform intensity throughout the entire structure. Heretofore in buttress dam design the common practice has been to obtain economy through the use of relatively thin and closely spaced buttresses. During the past thirty years about 300 such dams have been built and have given excellent service. These dams were built at from 20 to 40 per cent less cost than that of equivalent gravity dams, and at the same time safety factors against sliding and overturning were attained which were approximately double those used in conventional gravity dam designs. An excellent example of a dam of this type, in which both maximum economy and structural improvement were attained through correctly proportioning the structure, is afforded by the 75-foot high Ambursen dam just completed for the water supply system of the city of Prescott, Arizona. This structure was proportioned so that the maximum stresses were of substantially uniform intensity on any horizontal plane. In such a design no material is misplaced or wasted, as each particle in the dam is doing approximately the same amount of work. Fig. 2 shows* the distribution of the maximum inclined stresses for the Prescott dam.

Modified Buttress Type

As a logical step toward the reduction of cost, modified types of buttress dams have been developed in which form costs have been minimized. This type consists of very massive widely spaced buttresses or piers which support unusually thick water-bearing members. These types retain the massiveness of the gravity dam (which, when representing correctly placed material, is sometimes actually desirable for the larger municipal projects) and the high safety factors which are characteristic of the buttress dam. Representative of such improved types is the dam shown by Fig. 3, which actually gives the structural strength that such massiveness implies, rather than the fictitious appearance of strength that is characteristic of the gravity dam. The massive-buttress dam shown by Fig. 3 has a lower volume of material and also would cost less than a properly designed gravity dam of equal height. The massive-buttress type shown, however, has an overturning safety factor three times as great, and a sliding factor two times as great as those of the gravity dam. The internal stresses, which control neither the gravity nor the massive-buttress designs, are low. A further advantage that the massive-buttress type dam has over the gravity type is that its pressures are approximately uniformly distributed throughout any horizontal section, whereas a pressure diagram of the typical gravity dam must be triangular in form. Uniform stress distribution tends to eliminate unequal foundation settlement throughout the section. This is particularly important if the dam is constructed on a difficult foundation.

* Proceedings of the American Society of Civil Engineers, December 1932, P. 1802.

Water-Bearing Members

Next to the buttresses in structural and economic importance are the water-bearing members that span between these buttresses. Up to a comparatively recent date the water-bearing members of buttress dams were limited to the conventional Ambursen flat-slab type as shown by Fig. 4a and the now disfavored multiple arch type as shown by Fig. 4f. The Ambursen type is a statically determinate structure consisting of a reinforced concrete water-bearing slab supported by haunches or corbels. This type combines great adjustability and resistance to lateral thrust. The multiple arch type is a rigid and statically indeterminate structure with little or no lateral stability. There has been a marked trend in recent years toward the use of types of dams which are both articulated and statically determinate for water supply projects, partly owing to the unsatisfactory record of the multiple arch dam.

A modified type of water-bearing member, Fig. 4d, also suitable for municipal water supply dams, which retains many of the advantages of the type shown by Fig. 4a has been developed recently. This type consists of two structural members, both curved in form with the intradosal surface of the upstream member in contact with the extradosal surface of the downstream element. The water-bearing surface, however, has a flat upstream face and the member is designed to function both as an arch under normal loading conditions and as a brace in the event that there is lateral movement of the buttresses such as might occur during an earth-

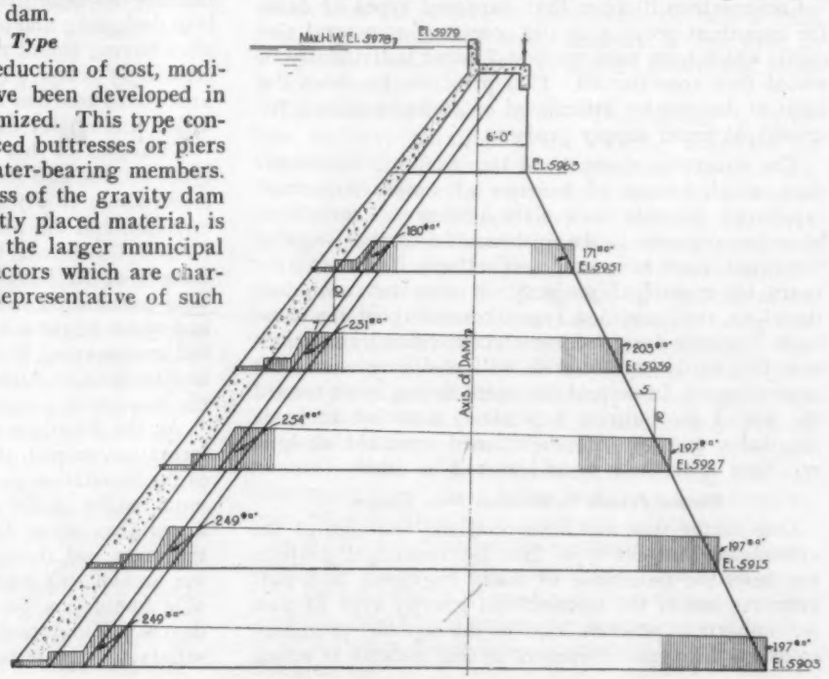


FIG. 2. *Maximum Inclined Stress Distribution, Prescott Dam*

quake. The downstream element is proportioned to take the entire water load from the reservoir.

A laminated water-bearing member of this kind is a better design than a very thick arch constructed as a monolith. A thick arch with a flat upstream face could not be constructed monolithically without introducing serious tensional stresses on the upstream face. The lamination eliminates all tensional stresses in the principal or downstream water-bearing member and at the same time greatly reduces the rib shortening stresses in both members. If desired, the downstream arch can be drained, as shown by Fig. 4d, in order to prevent the full static pressure from building up on this arch during normal loading conditions.

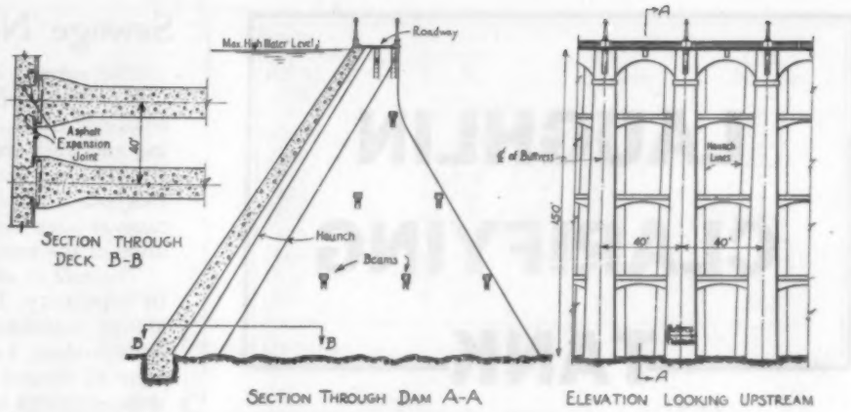


FIG. 3. *Modified Buttress Type Dam*

A more flexible type of water-bearing member of the flat-slab type having many of the same characteristics as that shown by Fig. 4d is the laminated slab design shown by Fig. 4e. This design also offers a high degree of resistance against earthquake shocks.

Another type of water-bearing member that has recently been given favorable consideration is the round head buttress dam, an invention of the late Fred A. Noetzli, well known consulting engineer. In this type of dam the buttresses are flared near their upstream ends to form abutting bulb-like sections with cylindrical upstream faces, as shown by Fig. 4c. The advantages of this type of construction are that all water pressures are radially directed to the center lines of the buttresses. The stresses in the rounded water-bearing member are therefore entirely in compression, and diagonal tension and bending stresses are eliminated. The 130-foot high Don Martin dam in the State of Coahuila, Mexico, was the first of this type to be constructed. Another dam of this type is being built near Mexico City.

Dual Purpose Dams

Combinations of structural members such as described in the foregoing may be arranged for the purpose of multiplying the functions of the dam as well as for increasing its structural strength. For example, many water supply projects involve both a dam and a plant, which latter consists of the usual reservoirs and basins located some distance below the dam.

An improved type of dam in which the tanks and basis of a water purification plant have been consolidated with the structural members of the buttress dam has been developed recently. Such a type of dam was constructed for the city of Clinton, Oklahoma. Using such a combination of structural and hydraulic elements not only reduced the cost of storage development by approximately 30 per cent, but also gave a greater margin of structural safety to the dam. The weight of the various tanks included in a composite sructure such as the Clinton dam increases the resistance to both sliding and overturning. The possibility of accumulation of hydrostatic pressure under the floors of the tanks is entirely eliminated by a system of drains filled with gravel.

An additional advantage of this composite plant is that the loss of head which ordinarily occurs between the dam and the various reservoirs is eliminated. The elimination of lost head is one of the important benefits obtained by the use of this dam because it removes the fixed operating loss that would exist throughout the life of the structure. Other economies are also effected through the elimination of buildings to house pumps and equipment.

Conclusions

Thirty years of experience have shown that the articulated buttress dam may be constructed with both great safety and economy. Now that precedents of successful performance have been established for this type, advantage should be taken of its superior structural and economic features. It is anticipated that engineers will adopt it frequently for important municipal projects.

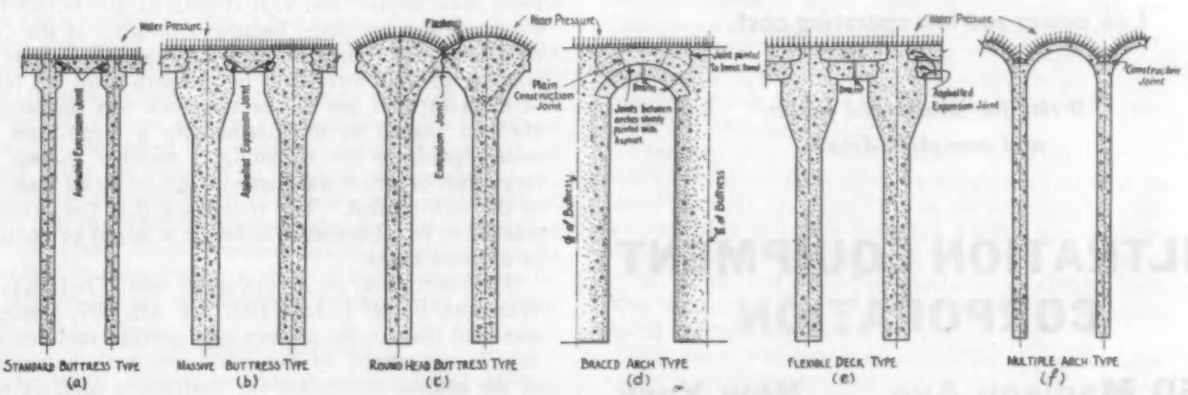


FIG. 4. *Water-Bearing Members of Various Types of Dams*

LAUGHLIN CLARIFYING TANK

Low Power and Low Operating Cost

Provides more complete removal of suspended solids from sewage and industrial wastes.

Permits of usual sedimentation and thickening operations within a tank, at high capacity for a given tank size.

Removes solids by positive filtration through a filter bed which extends around entire circumference of tank, extending inwardly five feet or more.

A traveling magnet cleans the filter bed as necessary.

Tanks of round or rectangular type for any capacity.

Low power and low operating cost.

Write for illustrated folder and complete details

FILTRATION EQUIPMENT CORPORATION

350 Madison Ave. New York

Sewage Notes From Schenectady

The volume of sewage reaching the Schenectady sewage treatment plant in 1932 reflected the changed economic times. During dry weather, the early morning and week-end flows were so low that dangerous septic action occurred in the trunk sewer. (The system carries both storm and sanitary sewage.) Daily peak flows came at later hours and the effect of shorter-week operation of the two large industries was easily seen.

The *sale of sludge* from the disposal plant increases in popularity. Last year was the ninth in which all sludge produced was disposed of to farmers and local householders. Last year the storage piles in the fields were all cleaned up by the end of September, due to an unprecedented heavy demand starting in August; and from then on, the purchasers obtained sludge from the drying beds, loading it themselves unless the crew were working on the beds. Because of this, use of the city team was discontinued for several weeks during the middle of the season and a full month earlier than usual in the fall, and an important saving to the city of labor and team hire was made possible by sludge removal by the farmers. In addition, the sale of sludge at 25 to 75 cts. a load, depending on the size, netted the city over $200. Sludge is being used for all kinds of crops and on lawns and flower beds. A cemetery took 100 loads for grassing sandy soil.

Clogging of trickling *filter nozzles* was kept low by great care in tank operation and cleaning effluent screens. On the three acres of filters the average daily clogging was 107 nozzles; the number was under 100 on 205 days. Clogging averaged 13 per mg. and 8.5% of the nozzles in service.

The heavy gelatine that formed around the nozzle dome and spindle reduced the size of the orifice, tended to clog the nozzle more frequently and to reduce distribution efficiency. The nozzles were washed three times during the winter months and improvement in nozzle clogging resulted. Ice formation was particularly low on the beds directly after washing, showing the effect of this cleaning on distribution. During the summer, three short periods of bed resting resulted in drying and washing off the film on the nozzles.

Interest of Councilman in Contracting Partnership

The Court of Appeals of Kentucky, Collinsworth v. City of Catlettsburg, 32 S. W. (2d) 982, holds that a paving contract with a city was not rendered void so that there remains only a positive ministerial duty under Ky, St. §3484, which provides that a contract with the city in which an officer of the city is interested shall be null and void if entered into before the officer vacates his office, because a member of the city council at the time the contract was let became a member of the contracting partnership after his term of office expired but before the work was completed. He had loaned to the partnership a large sum of money prior to his becoming a member thereof, a large part of which was loaned while he was a member of the city council. The court said that the practice was not to be commended, although it might be excused in extreme cases.

The court cited, as an analogous case, Fredericks v. Wanaque, 95 N. J. Law 165, 112 Atl. 309, where it was held that, in the absence of a corrupt understanding or agreement by the contractor with a member of the council voting for the contract, a contract was not rendered illegal because the contractor thereafter purchased supplies from a member of the council.

Month	Temp. °C	pH	M.O. alk. P.P.M.	Supnt. susp. solids P.P.M.	Gas production Cu. Ft.	CO_2 Percent	CH_4 Percent
Feb.	10-24	6.9	380	488	none	*	*
Mar.	22-27	6.3	620	*	17,000	29.0	60.0
Apr.	25-27	7.0	1150	1000	81,100	26.2	72.8
May	25-27	7.3	1800	710	56,200	29.3	69.5
June	25-27	7.3	2040	840	80,400	*	*
July	24-26	7.5	1720	582	62,400	*	*
Aug.	27	7.6	*	640	56,000	*	*
Sept.	25-27	7.6	1770	480	54,500	*	*
Oct.	25-26	7.8	*	760	58,400	*	*
Nov.	22-25	7.6	*	876	46,900	*	*
Dec.	23-26	7.5	2380	562	53,600	28.9	63.6

Table of Digester Operation

Operation of a Small Sewage Treatment Plant

By Floyd G. Browne

Gas production continuous since the twenty-eighth day, with no foaming, and no pH correction necessary.

DELPHOS, Ohio, had a population of 5,676 by the 1930 census. About 62% of these are served by 15 miles of combined sewers through 1300 connections, contributing about 460,000 gallons of sewage a day. All the dry-weather flow is taken by a 48" interceptor to a treatment plant, which was put into service in February, 1932.

This plant was designed to treat 600,000 g. p. d. from 6,000 population. It consists of a hand-raked bar screen; two grit chambers; a Link Belt mechanically cleaned clarifier; a Dorr gas collecting type sludge digester; a Wallace & Tiernan solution feed clorinator; three sludge beds with King glass enclosures; a Dorrco sludge pump to pump fresh sludge from clarifier to digester; three Fairbanks-Morse pumps, two of 500 g. p. m. and one of 700 g. p. m.; and storm water overflows and by-passes. (The bypasses were used a total of 9½ days in 1932). The pumping and chlorinating equipment and an office and laboratory are housed in a brick building. The plant alone cost about $40,000. The works were designed by the A. H. Smith and Niles Co. of Toledo, and built by Bever and Morris, of Cleveland.

Plant Operator

The plant is operated by one man who, in addition to attendance during the day, goes to the plant whenever, during the night, heavy rains occur or storm water conditions call for attention to pumping equipment, gate settings, etc. His duties include inspection, cleaning, maintenance and operation of plant devices; sampling sewage, treated effluent, fresh solids, digester overflow and sludge at definite intervals, and compositing the sewage samples proportionally to the flow of sewage; performing simple laboratory tests to check performance of various devices; determining the dissolved oxygen content of the receiving stream at points above and below the plant as an index of stream conditions; keeping the daily records; painting and general plant site policing which is necessary for the neat appearance of the plant. It is recommended that another man be trained in these duties, so that a relief operator may be available in case of sickness or incapacity of the regular one.

Technical Supervision

Technical supervision has been furnished by the writer since the starting of the plant. During the eleven months of 1932 he made 24 inspections of the plant and 21 of the receiving streams, examining the operation of each treatment unit and discussing same with operator, sampling and examining the receiving stream, and collecting catch samples and composite samples for subsequent analysis in his laboratory. A report of analyses and operating data is made each month to the Director of Public Service of the city and to the State Department of Health.

The State Board of Health requires that all new sewage treatment plants be operated by competent technical operators, on a full-time basis for the larger plants and on a part-time basis for the smaller ones. About twenty-five of the plants of the smaller municipalities of Ohio are under the supervision of sanitary engineers and chemists on a part-time basis, in addition to the several larger plants under full-time supervision. The amount of supervision depends on the size and type of plant and degree of treatment required, size of receiving stream and whether or not used for water supply or recreation, whether law suits are pending, etc. It is recommended that all plants be in charge of a competent, technically trained engineer throughout its life; a principal advantage of which is that the operating routine which has been found best for this particular plant will be carried over from administration to administration.

Operating Results Obtained

Screen and grit chambers. The bar screen—6 lineal feet of 1½ inch openings set at an angle of 45°—removed during the year a total of 30 cu. yds., an average of 5.2 cu. ft. of screenings per million gallons, which were buried in a nearby low area. Raking of screens was performed by hand whenever necessary. The grit chambers were used during the first flush of a storm to intercept sand and cinders from the pumps. Each is equipped with a weir designed to maintain an average velocity of one foot per second. They removed a total of 9.7 cu. yds. during the year.

Clarifier. The clarifier removed 86% of the suspended solids or 98% of the settleable solids, and reduced the B. O. D. about 59% on the average.* A good concentration of solids (average 7.1%) was obtained when the mechanism was used from 10 to 15 minutes daily. Scum was removed regularly to sludge beds. Odor was almost entirely absent. The actual detention period averaged 2½ hours.

Digestion. The performance of the digestion tank when the plant was first put into service was perhaps the

*Based on composites of day-time flows. Analyses of 24-hour composites showed somewhat less reductions.

Water Filters and Filtration Plant Equipment

for Domestic and Industrial Service

SWIMMING POOL FILTERS AND RECIRCULATING PLANTS

EQUIPMENT FOR SEWAGE TREATMENT PLANTS AND PUMPING STATIONS

We serve as skilled contractors to furnish and install the complete equipment, piping, etc., in all forms of water and sewage plants.

ROBERTS FILTER MFG. COMPANY
640 COLUMBIA AVE. DARBY, PENNA

Use PFT Equipment *for* Sewage, Water *and* Industrial Waste Treatment

Write for Latest Bulletins

PACIFIC FLUSH TANK COMPANY
Designers & Manufacturers of Sewerage and Sewage Treatment Equipment
4241 RAVENSWOOD AVE. CHICAGO, ILL.
EXCLUSIVELY SINCE 1913
136 LIBERTY STREET NEW YORK, N.Y.

HITCHINGS
SUPER-FRAME
GLASS COVERS
For Sludge Drying Beds and Spray Houses.

Inspect Our Installation at Little Falls New Jersey
H. J. Harder Engineer

Send for our Engineers' Folder
Call on us for plans and specifications
Hitchings Company
ELIZABETH, N. J.

Please mention Public Works *when writing advertisers*

most interesting feature of the year's operation. The tank is 35 ft. diameter and 18 ft. deep and has a total sludge storage capacity of 15,000 cu. ft., or 2.5 cu. ft. per capita of design capacity. It produced gas in 28 days and has continued to produce an average of 1840 cu. ft. per day, which is less than one would expect from a contributing population of 3,000 persons.

The digester was placed in operation by first filling it with raw sewage and bringing the sewage to working temperatures (70-80°F.) by running the circulating system and the stirring mechanism continuously. As soon as this temperature was reached the clarifier was placed in operation and its accumulation of fresh solids (approximately 400 gallons daily) pumped into the digester. Close check was kept on pH, alkalinity, and suspended solids of the displaced supernatent. It will be seen from the following table that the pH and alkalinity rose to a satisfactory figure in a relatively short time, consequently no foaming was experienced and no pH correction was necessary. Digestion takes place in a relatively short period at a temperature of 78°F., there being a reduction in volatile matter from 60% to 39% and a reduction in moisture content from 93% to 84%. Solids suspended in the digester overflow have not been excessive and are being reduced by careful management.

The stirring mechanism has operated free of trouble and is showing no overload on the motor. The only trouble experienced in maintaining the 78°F. was occasioned by a burst coil in the hot water heater. This trouble has been eliminated by the installation of a zeolite water softener which reduces the initial total hardness of the tap water (488 p. p. m.) to such an extent that scale formation is greatly retarded.

In view of the apparent low gas production it seems that a test of the gas meter and gas lines should be made in order to determine whether there is any defect in the meter, or leakage in the lines.

Sludge beds. The three glass covered sludge beds have received 214 cubic yards of black, inoffensive and well digested sludge from the digester. As yet no dry sludge has been forked off. The beds are each 12 ft. 11 inches x 88 feet 8 inches in size, and have a total area of 3,427 square feet, or a designed per capita area of .57 square foot.

Cost

Cost of sewage treatment for 11 months operation, as furnished by the Department of Public Service, is as follows:

Payroll	$1,929.10
Pumping	569.75
Equipment, maintenance, repairs, and chlorine	841.18
Total	$3,340.03

The total is equivalent to 59 cents per person per year, or about $21.90 per million gallons of sewage treated.

Some work has been done in grading, landscaping and site development, and more is contemplated as an unemployment relief project when weather permits.

Acknowledgments

The sewage treatment program is under the direction of A. E. Weger, director of public service. J. J. Wahmhoff is superintendent of the sewage treatment works. Their hearty co-operation and conscientious efforts have made possible the accomplishment of a satisfactory program of sewage treatment.

Emergency Sanitation Following the California Earthquake

Immediately following the earthquake at Long Beach, Calif., on March 10th, acute problems in sanitation occurred and it became necessary for the chief of the State Bureau of Sanitary Inspections and six inspectors to proceed at once to Long Beach. Following a conference with Dr. Giles S. Porter, director of public health, and Dr. G. E. McDonald, city health officer of Long Beach, the chief of the bureau immediately assumed charge of all activities relating to sanitation with the exception of those relating to central sewage disposal and water supplies.

Organization

The city was divided into a number of districts for purposes of organization and house to house surveys were made to ascertain conditions relating to plumbing, broken water pipes and broken sewer pipes. Matters relating to garbage disposal were investigated at the same time. Inquiries were also made relative to persons who might be sick or injured.

The personnel to carry on this work became greatly augmented through the arrival of employees from the health departments of Long Beach, Pasadena, Los Angeles and Los Angeles County. The personnel worked under the direction of the chief housing inspector of the Long Beach City Health Department, chief inspector of the Pasadena Health Department, director of housing and sanitation of Los Angeles City Health Department, and the sanitary instructor of the Los Angeles County Health Department.

State inspectors from the Department of Public Health undertook investigations and inspections of sanitary conditions in refugee camps which were established in city parks and other places. Men furnished by the county stabilization bureau and the Reconstruction Finance Corporation were formed into groups for the purpose of placing and maintaining these camps in safe and sanitary condition. The concentration of isolated groups of refugees into larger camps was started quickly, in order to facilitate supervision over the sanitary conditions of the camps.

Disinfection

A disinfecting crew was organized and equipped with material and transportation. A rodent control squad was formed and an intensive rat extermination campaign was carried on at the same time. After ten days, conditions with regard to the public health were regarded as normal and efforts were started to persuade residents to return to their homes.

Four physicians and several nurses from the State Department of Public Health were also detailed to Long Beach, where they assisted local authorities in the provision of immunizations against typhoid fever. This procedure was undertaken purely as a preventive measure. No cases of typhoid fever were found the sources of which could be associated with any conditions that arose because of earthquake damage. The Southern Pacific Company furnished a Pullman train which was used temporarily for the housing of refugees.

The assistance given by all health departments, private organizations and by the State was appreciated by the authorities of the communities involved, and the fact that no unfavorable health conditions followed the earthquake indicates that timely and successful results were achieved in the provision of proper sanitation.

Fine Screening May Solve Your Sewage Problem!

FINE Screening removes suspended matter from sewage, producing a residue with less moisture content than tank sludge. The screenings can be destroyed in a MUNICIPAL-DECARIE incinerator without odor or nuisance.

Fine screening is under complete mechanical control and therefore is not subject to the uncertainties of bacteria or of the weather.

The M. S. S. Corp. Disc Screen embodies improvements and new features such as the new Rima screen plate (Patented). This screen plate offers a far greater free open area and is made in a variety of metals to fit requirements, is furnished in varying degrees of fineness from ¼ m.m. to ¼ inch, is rigid, durable, accurate, and of high filtering efficiency.

Where there is sufficient dilution, it may be used as the only treatment.

Where further treatment is necessary, it relieves the burden from sedimentation or Imhoff tanks, permitting smaller installations or eliminating the necessity of enlarging an overburdened plant.

Slow motion of revolution is always assured by the automatic speed control which prevents comminution of solids and reduces the power required for operation. A 10 M.G.D. screen can be operated with a 5 h.p. motor.

Our Engineers will be glad to suggest methods of solving your problem.

MUNICIPAL SANITARY SERVICE CORP.
ROOM 2703
155 EAST 44TH ST. NEW YORK, N. Y.

Other Products

Schofield Bar Screen
Vacuum Filter for Sewage Sludge
Schofield Bar and Fine Screen
Municipal-Decarie Screenings Incinerator
Vacuum Filter for Sewage Filtration
Pneumatic Ejectors

FINE SCREENS

Building a Road to the Bouquet Canyon Dam

Building a New Reservoir for Los Angeles

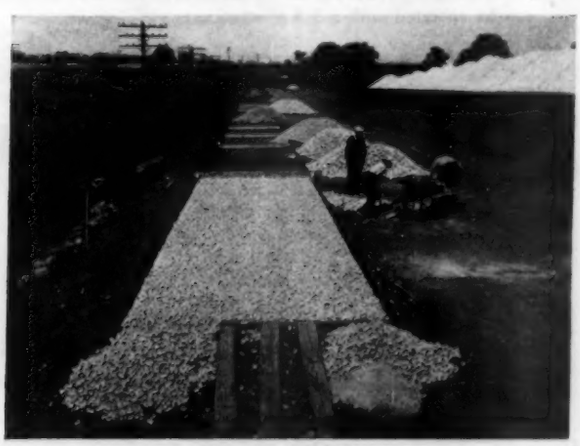
Located almost directly north of Los Angeles, Cal., a distance of approximately 75 miles, lies the deep and narrow valley known as the Bouquet Canyon. At the summit, at an elevation of about 3650, the Department of Power and Water, of the City of Los Angeles, is now building a reservoir with a capacity of 35,000 acre feet, for impounding the waters brought down to it by aqueduct, from the high Sierras in the Owen Lake district about 300 miles north of the city.

This reservoir will replace the ill-fated San Francisquoit dam which collapsed in March, 1928. The water is intended for domestic use only. No power is to be generated with it.

The dam will be constructed with an earth fill, faced with stone, with side slopes of 3 to 1, a height of 200 ft., and a width of 50 ft. at top. Over 3,500,000 yards of dirt has to be moved. The material is hauled in by caterpillar trucks of 8-yd. capacity, spread by caterpillar bull dozers, and tamped with sheep's foot tampers. It is estimated that the project will cost $4,500,000, and will require two years to complete.

The illustration shows work on the Bouquet Canyon County Road, which makes a high line over the crest of the dam. As soon as this road is completed, these shovels will be used in the borrow pit, and for excavation in the dam. The shovel shown is one of two Link-Belt, 1¾-yd. diesels.

All of the work is being done by the Los Angeles Dept. of Power and Water, of which H. A. Van Norman is Chief Engineer.



Cement Bound Macadam Test Road at Elmhurst, Ill.

Cement Bound Macadam Test Road

Engineers planning to attend the Century of Progress Exposition in Chicago will have an opportunity to see one of the most interesting tests in road construction that is to be carried on anywhere in America this summer.

To assist engineers and contractors in securing efficiency and economy in the design and construction of cement bound macadam, the Portland Cement Association is engaged in building an experimental road of this type, near Elmhurst, Illinois, just west of Chicago. Sixty test sections are to be built, making a road 1,200 feet long.

The principal objective of this test is to develop and demonstrate design and construction practices that will permit cement bound macadam to be used efficiently under practically all conditions. Field tests will be reinforced by investigations in the Association research laboratory. Crushed stone, slag, and gravel will be used in the various test sections, with grout of varying consistencies. Included with many tests will be the effect of vibration, as compared with rolling, in securing compaction and thorough penetration of the pavement.

Construction started during the week of June 12 and will continue approximately five weeks.

Procedure in Contracting for Garbage Incinerators

DURING the past ten years, incineration of garbage has been adopted by nearly all cities which made a choice of method of disposing of this material, and incinerators have been constructed having a daily capacity of approximately 24,000 tons and involving an expenditure of about $24,000,000.

This choice of incineration resulted largely because of engineering development on the part of incinerator builders, and attention given to design and principles of combustion whereby it was demonstrated to be practicable to dispose of all the garbage of a municipality through utilizing the full value of the colectable dry combustibe waste, at temperatures sufficiently high to insure the complete oxidation of all gases and the elimination of the nuisance which had attended earlier installations in which low temperatures had been employed.

In securing incinerators during this decade, municipalities employed procedures varying from a bare invitation for bids for a plant able to dispose of the city's refuse, to issuance of plans and specifications wherein were fully detailed the requirements for buildings, foundations, furnaces, combustion chambers, flues, pre-heaters, chimneys, handling equipment, and all appurtenances and appointments. In most cases, however, the municipality specified the capacity, with varying requirements relating to quality of materials and performance in test, requiring guarantees covering capacity, efficiency, freedom from nuisance, and the like; and required the bidders to submit plans and specifications for the plant bid on, with statements setting forth the efficiency and economy to be secured in operation.

In preparing such specifications, engineers should be careful not to be influenced by representatives of manufacturers to include therein provisions which would exclude bidders who are qualified by experience and performance to furnish a satisfactory plant. On the other hand, the greatest care should be given to requiring high standards of excellence in construction and performance of the plant.

Two recent procedures out of the ordinary are notable. Washington, D. C., in 1931 received bids for two plants on detailed plans and specifications prepared by a firm of consulting engineers of outstanding ability and reputation, all bidders thus submitting proposals for plant and equipment of identical design and construction. From this it resulted that, as full responsibility for the design was assumed by the District of Columbia by delegation of the work to the engineers, and no guarantees other than those with respect to workmanship and materials were required, proposals were received from construction companies over the country which had little if any knowledge or experience in the incinerator art. It resulted that some bids were at exceedingly low levels, and the successful bidders were outside the recognized incinerator manufacturers.

This procedure is open to the criticism that in some cases less competent engineers will be employed and incinerators of inferior design and construction are sure to be built, while the contractor will be free from responsibility for unsatisfactory operation. Also progress in design among manufacturers will diminish, although, on the other hand, it may effect standardization and gradually eliminate the less efficient types, and lower construction costs.

The other case is that of New Orleans, in purchasing three plants in 1926. The commission selected two types of incinerators which it considered satisfactory and arranged with the manufacturers of these to design complete plants adapted to the requirements, giving bond that, if completed in accordance with the plans and specifications, they would meet the guarantees set forth by the city, even though built by others. Bids were received from others as well as the designers, it being provided that, should the designer not be the successful bidder, he would permit the use of his design by such bidder, provide all necessary engineering details and field representation during construction; the city to pay for the plans and specifications and for any patented features used, and for the engineering, supervision of construction and the performance test. Bids were received for separate items such as buildings, furnaces, chimneys, etc., and the contracts for the furnaces and all accessory units, including chimneys, went to one of the designers, while those of the building work went to local builders.

The New Orleans plan offered the advantage of receiving fully competitive bids on two types of plants of long-proved excellence, with guarantees of performance.

Recently, owing chiefly to financial conditions, there has been a tendency to contract for disposal of waste, the contractor to build his plant on land owned by the city and turn it over to the city at the end of the contract period; the annual payments by the city providing for this as well as for his services.

The above is abstracted from a paper before the American Society of Municipal Engineers by I. S. Osborn.

Advantages of Diesel Engines for Pumping Stations

Reasons why it is, in his opinion, desirable to make general use of high-speed Diesel engines as prime movers for pumping stations were explained by Elliott Earl, consulting engineer, in a paper before the New England Water Works Association; following which some of his statements were discussed by Arthur L. Shaw. These statements are abstracted briefly herewith.

Honors for the invention of the compression ignition oil engine should apparently be divided between Herbert Ackroyd-Stuart of England and Rudolph Diesel, a German. However, the modern so-called Diesel engine is quite different from what they had in mind.

In efficiency, the internal combustion engine is much superior to the steam engine, having attained 40% when working at its full load output; while the highest overall efficiency achieved in practice with a steam turbine is 28.7%.

For proof of reliability, he points to the use of Diesels in the best airplanes.

In first cost, a Diesel engine-powered plant would in most cases exceed other types, although it is possible the cost will be reduced by future improvements.

Maintenance costs are generally less. A committee of the American Society of Mechanical Engineers in 1931 stated that for 119 plants containing 330 engines the average cost of engine repairs was 0.52 mills per net kwh of power generated.

As to labor cost, any intelligent steam engineer can easily learn to handle Diesel engines, and as no license is required to operate them, less wages need be paid the operator.

For operating cost, comparison is made between a steam pumping plant averaging 54.5 mgd lifted 84 ft. at a cost of approximately 16.4 mills per equivalent kwh, while a Diesel plant is cited, having comparable power rating, which operated for 6.41 mills—a saving of 1 cent kwh by the Diesel plant.

Commenting on these cost figures, Mr. Shaw said: "At prevailing prices, Diesels have usually appeared uneconomical in total annual cost except in those instances where practically continuous operation has made it possible to take full advantage of admitted operating economies as an offset to high fixed charges. . . . Should unit costs drop into the price range of high-grade gasoline engines, Diesel engines will find many applications as stand-by and part-time units. Such prices are, however, as yet but a prophecy."

The higher the speed, the smaller the engine, and so generally the lower the cost. Mr. Earl explains several advantages of high-speed Diesels—those having a piston speed of 1200 ft. per minute or more. "The gasoline engine today costs from $5 to $15 per horsepower. . . . There is no reason why the high-speed Diesel should not ultimately come into this range. . . . It is believed that we are on the eve of seeing light, high-speed Diesel engines turned out in quantity production." The efficiency of a Diesel engine is independent of size, and it is contended that we should employ a number of small units rather than one or two large ones, "because (1) we gain in efficiency of operation since the plant and each individual unit can be operated at the most economical load factor; (2) first cost is lowered; (3) most important, there is increased reliability of operation."

Spraying and Burning of Roadside Growths

The annual California program of spraying roadside vegetation to reduce the fire hazard to property adjacent to heavily traveled routes has been practically completed. This work was carried on in some forty counties of the State, and covered nearly 1800 roadside miles.

Under the plan adopted several years ago a fire break nine feet in width is created adjacent the highway fence lines by spraying the vegetation, while still green, with diesel oil. The oil kills the vegetation, which is then burned before adjoining areas dry up and create a hazard.

The diesel oil used is a 27° to 30° gravity. It is applied by power distributors equipped with an adjustable outrigger arm of sufficient length to reach out to the area to be sprayed and designed so that the spray bar may be readily raised or lowered to reach cut or fill slopes. About one-tenth gallon of the oil is applied in general to each square yard of surface, although where the work can be done when the vegetation is about two inches in height an application of one-twentieth gallon is effective on certain areas.

The work is confined to areas opposite grain or pasture land and forested sections. In general no work is done adjacent railroad rights of way, where orchards are alongside or similar locations where the hazard is limited by the natural conditions.

3500 Miles of Traffic Stripe Cost $163,000

A review of traffic striping work in California during the past year shows that practically 3500 miles of stripe has been placed at an expenditure of about $163,000. This includes restriping some of the heavier traveled sections in the Los Angeles and San Francisco territories. On the average, it cost $40 per mile for placing a 4-inch stripe during the last year.

Fifteen gallons of traffic lacquer was used per mile of stripe which represented about three-quarters of the expense. On all the striping work, whether handled by day labor forces or under contract, particular care is taken to secure a true, even line. The specifications require that a deviation of more than one-half inch from the true line in a distance of twenty feet indicates the standard maintained.

Lacquer Is Tested

The traffic lacquer is manufactured according to specifications prepared by the testing laboratory. Materials which go into the lacquer are tested separately and the manufacturing is done under the supervision of a testing engineer. The service to which the lacquer is subjected is severe. The prime requirements for a satisfactory material are set forth in the specifications, as follows:

1. It shall remain white under service conditions.
2. It shall dry under ordinary conditions sufficiently to allow traffic over it in from fifteen to thirty minutes after placing.
3. It shall show nonbleeding of oil or asphalt into the stripe.
4. It shall have good covering qualities.
5. It shall have good elasticity.
6. It shall have good durability under extreme weather conditions.
7. It shall satisfactorily resist the abrasive action of traffic.
8. It shall have good visibility.
9. It shall be of such consistency that the material may be used in the State paint spray machines without the use of thinners.
10. The lacquer shall not cake nor become unduly separated from the vehicle in storage.

Economy Experiment

Determination of the quantity of lacquer required to provide a satisfactory line, having a reasonably usable life, was based on experience with commercial brands of material. With the development of a specification material, designed to fit California conditions, it was felt that an economy might be effected by reducing the quantity of lacquer per mile. Accordingly, about 35 miles of stripe was placed in San Bernardino and Riverside counties, using varying quantities of lacquer from nine to fourteen gallons per mile. This work was completed the latter part of November. The test sections will be kept under observation to determine if an economy can be effected in the striping program without too great a reduction in the life and serviceability of the stripe.

The traffic stripe is regarded by the public in general, if letters written to the division are any criterion, as one of the most satisfactory safety measures, particularly on roads with relatively poor alignment, or in foggy areas.—*California Highways and Public Works.*

Developments in Engineering Equipment

New Portable Conveyor By Link-Belt

A new portable belt conveyor, suitable for handling any loose material and embodying numerous improvements over last year's model, is announced by Link-Belt Company, Philadelphia. Among other features, it incorporates fixed steel retaining sides extending the entire length of the conveyor, thus preventing lumps from spilling over the sides of the belt at any point.

To obviate a common source of trouble experienced with portable belt conveyors of this general type, the foot end has been improved to keep material away from the return run of the conveyor belt. Another feature is the new arrangement of the foot end plate, permitting the convenient use of the machine without this plate, when desired, minimizing labor in feeding, and serving to speed up loading.

"Kyano" Process for Making Blue-Prints

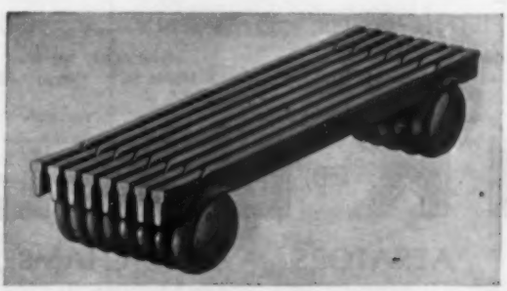
The C. F. Pease Co., 880 No. Franklin St., Chicago, Ill., has developed a new method of making blueprints and blue-line prints. This new method, which is designed to operate on Pease blue-printing machines, is claimed to prevent all bleeding or running of blues into white, producing a deep, brilliant blue from fast-printing papers, even after the paper has slightly "turned" from age or exposure.

New Type Screen Plate for Sewage Screens

The R. W. Disc Screens which are manufactured and installed by Municipal Sanitary Service Corporation, 155 East 44th St., New York, can now be equipped with the new type of plate known as fine slit Rima Sieves as indicated by the cut. The rights for its use on sewage screens have recently been obtained by that Company. The plate was developed in Germany and has recently been introduced in this country for use on screens and sieves of all types.

The plate is composed of wedge shaped narrow bars accurately spaced. The arrangement makes possible a free open area greatly in excess of that obtainable in perforated plates and consequently permits greater flows through screens of any given size or permits smaller perforations with equal flow. The slits can be formed as small as ¼ m.m. and as large as ¼". The wedge wires can be constructed of any suitable material such as stainless steel, monel metal or bronze. The bars are rigidly held together laterally to prevent spreading which has occurred in other ribbon type plates. The bars are capable of sustaining heavy loads and the enlargement of the slits by wear is reduced to an absolute minimum. The wedge shape bar also offers the distinct self-cleaning feature necessary in all sewage screens.

Disc screens now in existence can readily be refitted with a new type of plate to offer greater capacities or higher removal qualities.



New Type Screen Plate

A Very Small Motor for Water Pumps:

A new single-phase, fractional horsepower motor, specially designed for driving small water pumps, has been developed by the General Electric Company. Outstanding among the features of the new motor, which has been designated as Type RSA, are drip-proof end flanges to prevent dripping water from entering the motor, a large bearing-oil capacity which makes oiling of the motor unnecessary more than once a year, and a built-in terminal box for simplifying installation by eliminating all necessity for splicing and soldering connections. The performance characteristics of the motor are in accordance with N.E.M.A. standards for short annual service. The motor is available in one-sixth, one-quarter, and one-third horsepower ratings, with interchangeable mounting dimensions.

A Single Suction Self-Priming Pump

Buffalo Pumps, Inc., Buffalo, N. Y., has designed a completely new single suction pump, with built-in self primer.

The new pump, which is known as the Buffalo type "CP," is a very compact and economical unit. The casing is cast iron, and suction side-plate is template-drilled, with close clearance with impeller. Two types of impellers are available; on sump service, or wherever liquids are not clear, the open type is recommended, while for all services where clear liquids are pumped the enclosed impeller is commonly supplied.

The pump is furnished complete with all necesary fittings and is built in several sizes in capacities up to 450 G.P.M. and for heads up to 150 feet.

Barrett Switch Fitted Valve

Switch Fitted Valve

A check valve equipped with a mercoid flow switch has just been introduced by Barrett, Haentjens & Co., Hazleton, Pa. This new switch fitted valve is designated as the type "M" check valve, and fills a long felt need for the flow switch feature.

The purpose of the switch is to shut down the pump in the event that it loses its water during operation. The switch is connected into the low-voltage coil of the motor starter, and is actuated by the valve flap. When the pump is in operation and delivering water, the flow through the valve raises the flap and closes the switch. When the pump loses its water the flap falls, the switch opens, and stops the pump.

The switch can be arranged for either horizontal or vertical mounting of the valve. Complete information will be sent on request.

Pneumatic Application of Concrete:

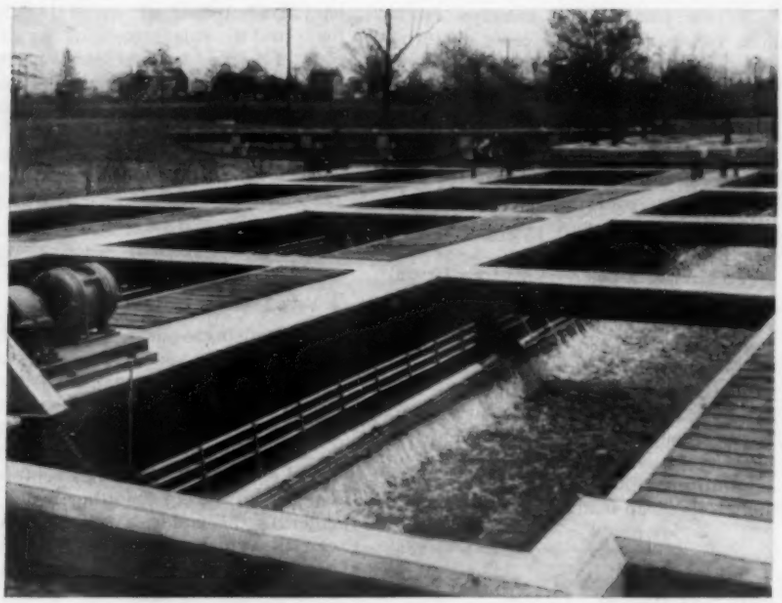
Production of a new extensive line of moderate priced machines for pneumatic application of cement, concrete and refractory materials is now in progress through the formation of a new company for manufacture of such apparatus by C. L. Dewey.

These machines are extensively used to pneumatically apply concrete and cement to structural steel; for coating or restoration of concrete, brick, tile or wood structures; waterproofing of basements and roofs; building thin walls; lining bunkers, reservoirs, etc., in applying crushed fire brick, fire clay and other refractory materials to boiler fire boxes and building up arches; for cleaning buildings by wet sand blast; for general industrial plant repairs and many similar purposes where a denser, stronger, more uniform and less expensive surface is obtained by "shooting-on" than by hand application.

The new concern is The Gunitor Company, with sales office and factory at 1227 W. Beardsley Ave., Elkhart, Indiana. With C. L. Dewey as President and General Manager are associated W. McK. White, Vice-President, and Sidney L. Dewey, Secretary.

[Short Talks With Sewage Plant Designers]

Sprinkling Filters Cost Lots of Money



THERE are two outstanding factors contributing to the cost of Sprinkling Filter installations:

(1) The price of the land they occupy.

(2) The enormous quantity of broken stone or other material required for the filter medium.

When conditions require a secondary oxidation treatment, why not use the modern activated sludge process, served by Link-Belt Straightline aerators? They require no filter medium, or air compressors for providing the one and one-half or two million cubic feet of compressed air for every million gallons of sewage treated.

Straightline aerators installed in tanks with rounded corners and longitudinal baffle, produce a spiral circulation and thoroughly mix the contents of the tank while simultaneously and continuously agitating and renewing the surface of the liquid, thereby injecting the oxygen required from the atmosphere. And it is "free oxygen"—always available without the use of compressors, pipes, tanks, etc.

Only one-fourth of the compressed air commonly used for activated sludge is required for furnishing the necessary oxygen—three-fourths of it is used just to circulate and agitate the liquid in the tank—that is a mighty expensive and crude way to purify sludge when a better way is available.

Link-Belt has spent years developing a form of aerator paddle of high efficiency and annoyance-free operation, as illustrated herewith, and known as the Straightline aerator.

This aerator is a simple, compact, efficient and dependable unit for the oxidizing treatment of sewage at a minimum of initial and operating cost.

Investigate by competitive estimates, how much less expensive and how much better the Straightline aerator is than other types, particularly for the smaller plant.

4781

LINK-BELT COMPANY

PHILADELPHIA, 2045 West Hunting Park Avenue CHICAGO, 300 West Pershing Road
SAN FRANCISCO, 400 Paul Ave. TORONTO, Eastern Ave. & Leslie St. Offices in Principal Cities

LINK-BELT

SCREENS ▲ COLLECTORS ▲ AERATORS ▲ GRIT CHAMBERS ▲ DISTRIBUTORS

See Our Exhibit at A Century of Progress, Chicago

For latest catalogs consult the *classified* INDUSTRIAL LITERATURE Section—pages 51-54

THE DIRECTORY OF CONSULTING ENGINEERS

JOHN W. ALVORD
CHARLES B. BURDICK
LOUIS R. HOWSON
DONALD H. MAXWELL

ALVORD, BURDICK & HOWSON

Engineers

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

Civic Opera Building Chicago

AMBURSEN CONSTRUCTION CO., INC.

Engineers and Constructors of Amburgen Dams.

Specialists in difficult hydraulic work, water-supply and irrigation dams, and hydro-electric plants.

295 Madison Ave. New York City

BABCOCK BROTHERS

Consulting Engineers

Specializing in Concrete Bridges and Viaducts

Steel Bridges, reports, surveys and investigations of Statically Indeterminate structures by the Beggs Deformeter Method.

DUDLEY P. BABCOCK
HENRY G. BABCOCK

10 Depot Plaza White Plains, N. Y.

BARSTOW & McCURDY

Incorporated

Civil and Sanitary Engineers

E. D. Barstow G. E. McCurdy
A. LeFeber W. S. Mathews

Sewerage and Sewage Disposal
Water Supply Municipal Engineers

Mendenhall Building Akron, Ohio
626 Broadway Cincinnati, Ohio

BLACK & VEATCH

Consulting Engineers

Sewerage. Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigation, Reports and Laboratory

E. B. Black N. T. Veatch, Jr.

Mutual Building, Kansas City, Mo.

FLOYD G. BROWNE

Sanitary Engineer

Reports Design Operation
Technical Supervision

Water Works — Sewage Treatment Works — Industrial Wastes Treatment — Laboratory Analyses

Marion, Ohio

BURNS & McDONNELL ENGINEERING CO.

Established 1897

Consulting Engineers

Lighting, Appraisals, Waterworks, Sewage, Rate Investigations.

Kansas City, Mo. 107 W. Linwood Blvd.
Los Angeles, Cal. West. Pacific Bldg.
Cincinnati, Ohio Dixie Terminal Bldg.

JAMES M. CAIRD

Assoc. Am. Soc. C. E.

Chemist and Bacteriologist

Water Analysis and Tests of Filter Plants

Office and Laboratory:
Cannon Bldg., Broadway & 2nd St.
Troy, N. Y.

H. BURDETT CLEVELAND

Consulting Sanitary Engineer

Water Supply & Purification Design
Sewerage & Sewage Disposal Reports
Refuse Disposal Consultation
Treatment of Investigation
Industrial Evolution of Works
Wastes Supervision of Construction

90 Wall St. New York

ROBERT CRAMER

Consulting Engineer

Sewage Disposal Plants and Sewerage Systems, Utilization and Disposal of *Industrial Wastes*. Power Plants. Design, Construction, Operation, Laboratory Service, Valuations and Reports.

647 W. Virginia St., Milwaukee, Wis.

A. W. DOW

Chemical Engineer

Consulting Paving Engineer

Mem. Am. Inst. Ch. Engrs.

Asphalt, Bitumens, Paving, Hydraulic Cement, Engineering Materials.

801 Second Avenue New York

HENRY E. ELROD

Consulting Engineer

Mem. American Society of Civil Engineers
Mem. American Society of Mechanical Engineers
Water Purification—Sewage Treatment
Utility Appraisals—Rate Regulation

Petroleum Building Houston, Tex.

FULLER & EVERETT

Hydraulic and Sanitary Engineers

Water Supply, Sewerage, Drainage, Valuations, Plans, Supervision of Construction and Operation

W. E. FULLER C. M. EVERETT
L. N. BABBITT

22 East 40th St. New York City

FULLER & McCLINTOCK

Engineers

George W. Fuller James R. McClintock
F. G. Cunningham E. W. Whitlock
C. A. Emerson, Jr. Elmer G. Manahan
W. Donaldson

Water Supply, Water Purification, Sewerage, Sewage Disposal, Garbage and Industrial Wastes Problems, Valuation and Rate Regulation of Public Utilities.

New York, 170 Broadway

HOWARD R. GREEN CO.

Consulting Engineers

DESIGN, SUPERVISION AND MANAGEMENT OF MUNICIPAL IMPROVEMENTS

Pavements, Sewerage, Water Supply, Investigations and Reports

208-210 Bever Bldg. Cedar Rapids, Ia.

DIRECTORY OF CONSULTING ENGINEERS—*Continued*

C. N. HARRUB ENGR. CO.

Civil and Sanitary Engineers

Member of Am. Soc. C. E.

Water Supply, Sewerage, Paving and Structural Improvements

712 Amer. Nat'l Bank Bldg.
Nashville, Tenn.

PAULETTE & WILSON ENGINEERING COMPANY

Professional Engineers
Utility Accountants

R. J. Paulette Murray A. Wilson

MUNICIPAL IMPROVEMENTS
PUBLIC UTILITIES
INVESTIGATIONS
APPRAISALS
RATE STUDIES

448 So. 8th St. Salina, Kan.

ALEXANDER POTTER

Civil and Sanitary Engineer

Specialties: Water Supply, Sewerage and Pavements

Phone Cortlandt 3195

50 Church St. New York City

NICHOLAS S. HILL, JR.

Consulting Engineer

Water Supply Sewage Disposal
Hydraulic Developments

Reports, Investigations, Valuations, Rates, Design, Construction, Operation.

Management, Chemical and Biological Laboratories.

112 East 19th Street
New York City

PEARSE, GREELEY & HANSEN

Hydraulic and Sanitary Engineers

Reports, Designs, Supervision, Appraisals, Water Supply, Sewage, Water Purification, Sewage Treatment, Refuse Disposal.

6 No. Michigan Avenue, Chicago, Ill.

HENRY W. TAYLOR

Consulting Engineer

Water Supply, Sewerage
Hydraulic Developments

11 Park Place, New York City

METCALF & EDDY

Engineers

Harrison P. Eddy John P. Wentworth
Chas. W. Sherman Harrison P. Eddy, Jr.
Almon L. Fales Arthur L. Shaw
Frank A. Marston E. Sherman Chase

Water, Sewage, Drainage, Refuse and Industrial Wastes Problems
Laboratory, Valuations

Statler Building Boston

MALCOLM PIRNIE

Engineer

Malcolm Pirnie Charles F. Ruff

Water Supply, Treatment, Sewerage, Reports, Plans, Estimates, Supervision and Operation, Valuation and Rates.

25 W. 43rd St. New York, N. Y.

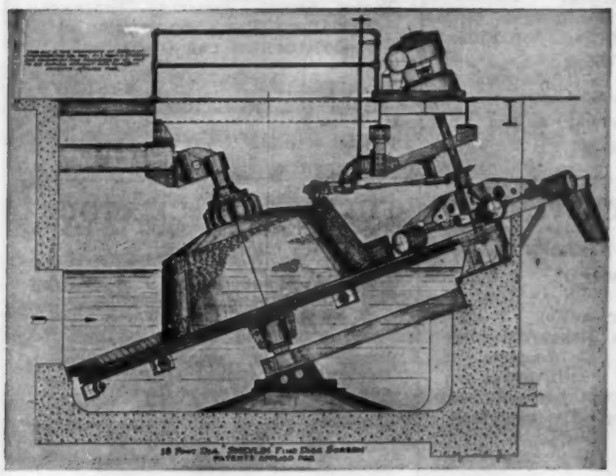
WIEDEMAN AND SINGLETON

Engineers

Water Supply, Water Purification, Sewerage, Sewage Disposal, Investigations, Designs, Supervision of Construction and Operation, Valuations and Reports

Candler Bldg. Atlanta

SHEVLIN FINE DISC SCREENS



Improved features found in no other disc screen

VARIABLE SPEEDS . . . SELF ALIGNING MAIN SUSPENSION BEARING
ADJUSTABLE SLOPING SEALS . . . MAXIMUM SCREENING AREA
SCREENINGS DELIVERED SUITABLE FOR INCINERATION

RUGGED, DEPENDABLE
AND AT REASONABLE PRICES

Shevlin screens have been modified from the original German design to meet the American conditions and to stand more severe operating conditions than the R. W. type of screen.

SHEVLIN ENGINEERING COMPANY, INC.
227 FULTON ST. NEW YORK, N. Y.

SIMPLEX

Simplex Indicating Recording Totalizing Meter Register

Venturi Type Meters
Effluent Controllers
Filtration Plant Gauges
Water Works Specialties

WRITE FOR BULLETINS

SIMPLEX VALVE & METER CO.
2017 South 68th Street
Philadelphia, Pa.

The American Water Works Association

Though the attendance at the fifty-third annual convention of the American Water Works Association was small compared to the pre-depression days, the quality of the papers of the members attending and of the week's events was very high. With two or three sessions morning and afternoon, inspection trips, the World's Fair to see, and all the other attractions beckoning, there was not an idle moment for anyone.

The convention really started for eastern members with the departure of the A.W.W.A. special Saturday evening. On this very pleasant trip, "Bill Orchard" entertained with music and some of the other members sang. Real business began Monday morning, however, with the first session at 10:00 o'clock. At 11:00, the convention was formally opened. Malcolm Pirnie was announced as the newly elected president for 1933 and 1934. Four new directors were also elected: E. Sandquist, city engineer and water superintendent of Havre, Mont., representing the mountain section; W. W. Hurlburt, engineer of water works, and assistant to the chief engineer of Los Angeles, representing the California section; Seth M. Van Loan, deputy chief of the Philadelphia Bureau of Water, representing the 4-states section; and W. R. Ge'ston, superintendent of water works, Quincy, Ill., representing the Illinois section.

Charles H. Spaulding, superintendent of water purification, Springfield, Ill., won the John M. Goodell prize as a member "who has made a substantial contribution to water works science." The Diven Medal for the "one who has best served the association during the past year" went to Samuel B. Morris, chief engineer of the Pasadena, Calif., Water Department. The personal equation was carried into the afternoon when memorial plaques were dedicated to Eli S. Chesbrough, De Witt C. Cregier, and John E. Ericson, the ceremony taking place at the "old Water Tower."

Later in the day, the superintendents' Round Table got under way, with discussions of consumer good will, consumer complaints, delinquent water bills, the use of several small vs. one large meter, and the measurement of small flows. The discussion was under the direction of H. F. Blomquist, superintendent of water works, Cedar Rapids, Iowa, and those leading discussions included Frank C. Jordan of Indianapolis, E. F. Dugger of Newport News, Va., M. F. Hoffman of Cincinnati, H. L. Monroe of Pontiac, Mich., and Dale Moffitt of Des Moines, Iowa.

The annual dinner of the "Service des Eaux" was held Monday evening. Later, an informal reception and dance was held.

The National Recovery act and the public works program were discussed on Tuesday, and later at a meeting of the Manufacturers' Association. There was a good deal of discussion, but no one had any real information regarding what will be done, and no specific data were added to the material already appearing in PUBLIC WORKS.

The Purification Dinner

The biggest real event of the second day (Tuesday) was the water purification dinner. W. J. Orchard presided in his very best style, appearing as the fire chief. The dining hall was crowded, and it was worth it. Good dinner and good entertainment; a lot of people who don't know much about water purification and care less were there—and liked it.

Wednesday was a very busy day with the Finance and Accounting section and main sessions held during the morning, and the main and water purification sessions during the afternoon. The afternoon meeting of the main body discussed cement lined mains—thickness; value; methods of cutting, tapping and handling; fittings; thickness of lining and other factors. The purification section covered quite a range of subjects, including "The Removal of Aggressive Carbon Dioxide by Limestone Contact Beds" by Charles R. Cox, N. Y. Dep't of Health; "Disposal of Lime Sludge from Softening Plants by W. H. Dittoe; Report of Committee on Filtering Materials, by John R. Baylis; "Control of Manganese and Iron Accumulation in Filter Sand," by P. W. Frisk, American Enka Corp., and "The Hydraulics of Rapid Sand Filters," by Professor Gordon M. Fair.

The annual dinner dance was held Wednesday night. Thursday, the plant management and operation division held a meeting in the morning and there was a joint session in the afternoon with the purification group joining with the general membership. The smoker on Thursday evening just about closed the convention activities.

A pleasant feature of the convention aside from the usual visiting of old friends was the distribution of oranges and raisins by the City of Los Angeles, which is making a bid for the 1935 convention. Here's hoping the depression will be over then and we'll all be there.

The following story of the convention has been received and is published herewith "as is."—Ed.

Dear Editor:

Ther story of the convenshun reely starts when we get on th' train at Trenten an' the first thing what we saw was that William Orchard and his parashute —yuh know, thet thing that opens and shets like when you squeeze it an' makes music. An' how he kin play thet thing. Well, he was playing it and thet handsome Bert Z. Holzer was a singing like cousin catbird on a spring morning. An' how he kin sing.

We wanted to stay there an' lissen, but we had to see the hole thing, so we kept on in to the next car and there was a couple of editers playing bridge with some pipe peddlers er something. Gosh, them editers is smart fellers. They just skun them salesmen all to pieces tell they wouldn't play ennymore. And so we went on ento the next car an' there was a man singing Sing a song of six-pents, pockets full of rye. He was a fine genrous feller too, but it was getting late and after a while we got sleepy an' the last we kin remember was a meeting of the assochiaton chapter of the Liars Club out on the back platform.

Sundy morning we woke up out in Ohio, an' its nice country but we wouldn't care to live there because the air aint so good and gives you a headake and a funny taste in your mouth in the morning, which ain't like the air where we live in Gods country. An' pretty soon we got to Chicago, an' all the boys was up by that time and we went over to the hotel an' saw the girls all ready to register our names an' it cost five dollars to talk to them there girls, but we guess maybe it was pretty near worth it—specially that one with the red hair.

Well there was lots of folks there we'd heard about and the first man we saw was Jack Hinman which was kinder natural he being the biggest man there, an' the best looking too. An' there was Clint Decker from Bummingham an' John Bayliss from Chicago an' Charley Spalding from Springfield an' a lot of others an' we was just renewing a lot of old acquaintances when one of them enervated carbon men invited us up to his room. Say he was fine feller and there was a lot of other fine fellers there too, and we got real friendly and visited around a lot of the rooms. These water works men aint specialists, you know them fellers what know more an' more about less an' less, but reel folks.

Well there wasn't much else to do but visit Sunday an' get acquainted and these water works men they are a fine lot an' we met them all an' several of them was kind enuf to tell us they had read some of our stuff in the brainteasers. Yessir, they are all OK.

It might a been something we et er maybe it was that Chicago air too but there was thet same funny taste and headake Monday am. Er maybe it was being up so high as we was on the 18 floor and thets way up an' in our town the highest building is only 4 stories and that ain't half rented. But we forget all thet as soon as things get going Monday which begun by putting up a brass plate to the men that started lake michigan which is a real nice lake now but kinder dirty water in it.

We wanted to lissen to them superintendents talks on consumers and keeping there good will but we couldn't find any room that had a round table in it like the program said and so we went ter see the worlds fair. Yessir that century of

progress is some fair and to look at it you wouldnt think it had been runnin' a hundred years already. The buildings looked right new and most of the people running it was kinder young. We didnt get all through it as we had to go back to that servis desso dinner which Jack Hinman invited us to, and it was kind of solum with most of the folks telling what they done and what happened to them in France, etc., etc., an' with Cernel Bartoe at the head of th' tabel.

Well after that was the recepting and the dance and some of them Chicago girls sure step around and we met another nice bunch of fellers an' after a while it was time to go to bed but we forgot what our room was on account of them big numbers and some of them salesmen what can find there way anywhere took us back to our room.

There was some mighty smart people on that Tuesday program and we found out how they find leaks in Chicago (water works leaks Mr. Eddy said and not any any other kind) and the Public Works in the Economic Scheme of things by Cernel Shevalleay and that was right down our home alley because PUBLIC WORKS has been awful economic with our brainteasers, you bet. An' then we went out to another meeting and they was talking about the depressing war in detroit which was the first we'd heard about war since the servis desso dinner the night before but not the first we'd heard about the depression. An' we didn't want to hear any more about that and so we went back to the other meeting and there was Cernel Shevalleay talking again and so we went out and looked at all them X-hibits. An' they was pretty nice, specially Wallis and Terenan and Door, which won prises. And then we went back an' they was still talking about PUBLIC WORKS yessir, the whole day was spent talking about PUBLIC WORKS which they sure must think is some magazine.

As we was going back to the pm meeting we met Lew Finch as used to be state sanitary engineer of Indiana and he sure is the prise hard luck man. He falls down on a icy sidewalk—that was last winter—and busts his leg in two places, an' his wife and three fourths of his children gets the scarlet fever and he gets an ampetation—yes, plumb ampytated from his job. These new govenors sure do love to make changes. An Lew is one of the best engineers we know an if there is anything we can do, Lew, just call on us, Mikey and Ikey, care of this magazine.

Well as we was going to the water purification dinner that night we thought we better get acquainted with them water purifcation fellers and so we went into that room, and there was a lot of folks we know, Flentje and Glace them bridge and golf players, though why they was in that meeting with such good golf weather we dunno. Musta been all tired out. An' Gorman and Gerstein and Jack Hinman again and C. P. Hoover (the cemicly Pure Hoover, they called him) and lots of others. So we had a nice afternoon which ended with Fred Stuart giving a paper in Allabamma er was it Floridy dialect—on carbon. An thet sure must be wonderful stuff because there don't seem to be ennything atall that it won't do, according to Fred.

An' there was a lot of water purifcation fellers wasn't there as ought to have been. That Streeter from Cincynatti who got caught in the new deal we hear tell about last fall, an' Vic Ehlers from down Texas way who got started for the convention but never did kum. How come Vic, tell us your story. An' Bol Clark, but he come in later.

An now we come to the reel thing of the hole meeting—the water purifcation boys dinner, And there was Mister Orchard—we'd learned to call him Bill too by this time—all dressed up like Ed Whynn—an it sure was some dinner, an some time was had by all. That Bill Orchard sure ken do things, play and sing and talk, an they charged us to dollars an fifty cents for that dinner as it was worth it but we'd rether have herd a little more from Bill. There was too many sideshows. An' say, he must a been a firemen onst the way he carried that Norman Howard, the bashful feller right up on the stage and made him set there. Well that was some dinner an most everyone was there and them that wasnt missed things.

Well that was finally over an next day we got back to work again an it was work with two meetings going on all at once all day an we'd sit for a while in one and then in the other an it was mostly about pipes and fixed property records and sech like and we don't smoke pipes and don't have no fixed property so went down to the X-hibits agen and there was a lady from Californeay passing out free oranges and inviting us all out to Los Angeles in 1935 probly figuring by that time the depression would be over an some of us cud get out there. Them oranges tasted right good an then she gave us other things that was like little dried prunes an we gave them to another feller an we went on an set down a wile with Ed Clark in a nice soft chair which Mr. Dressers folks supplied us with, and visited with Russell Scott a wile.

En then we looked over ther rest of the X-hibits and they was most intrestful. They was meters an' pipe an' tanks and valvs an' some of them magyzine men lookin' kinder lonesum, an' culverts, an' highdrants, an' errators an' whatknots, as the engineers say. An' we visitted with them all an' had a good time and lerned a lot.

Ther was enother dinner an dance that Wednesday night an most evry one had a big time. An Thursday morning at breakfast we was with one of them purification men and we asked him what was the matter with this chicago water that made it taste so bad in the morning, and he thought they ought to clorinate it or put enervated carbon in it. So we made up our minds we wouldn't drink any more of that Chicago water, but just milk or something like that which they say is pretty good in Chicago, but them Chicago restaurants is all the same and when you et in one you done et in them all, and breakfasts don't taste so good.

Then there was another round table meeting and we found out it didnt mean a round table at all but just for everyone to talk round the subject which they did. An the manyfacturers had a meeting thet mornin' and talked all round about railroad regylations and the iron business which means a lot to everyone in the water works business because all meters and pipe is shipped by railroads except where there is trucks and they use iron for pipe except when Cernel Longley can sell them concrete pipe.

Well thets about all about the convention because our feet was hurtin' by this time going from one room to another and looking our friends up now and then, and we jest took in the smoker and called it a convention. Yessir it was some convention and them water works fellers are fine fellers and we sure will be there to the next one. Yep, Malc Perny himself the new president invited us, and we wouldn't turn him down.

MIKEY & IKEY

New York State Sewage Works Association

By A. S. Bedell

The New York State Sewage Works Association held its spring meeting at the Hotel Seneca, Rochester, N. Y., June 9 and 10, 1933. One hundred and thirty members, guests and wives were registered. Following registration and inspection of manufacturers' exhibits Friday morning, the convention opened with a brief business meeting and the presentation of two technical papers, with discussion, during the morning session. One by Frank C. Roe, Engineer, The Carborundum Company, Niagara Falls, on "Some Things That Have Been Learned About Sewage Aeration by Diffused Air," was discussed by A. B. Holmstrom of the Norton Company, Worcester, Mass.; and the other by William Gavin Taylor, Consulting Engineer, Newark, N. J., on "Vacuum Filtration in Sewage Treatment," which was discussed by Arthur Wright of the Arthur Wright Associates.

At the luncheon Percival D. Oviatt, Mayor of Rochester, welcomed the association, and Gloster P. Hevenor, Chairman of the Committee on Exhibits, described "What's to Be Seen Among the Exhibits."

The afternoon session opened with a paper by L. A. Bergman, Director of Public Works of Jamestown, on "Sewage Treatment at Jamestown, N. Y." with a discussion by H. Burdette Cleveland, Designing Engineer. This was followed by a symposium on "The Operation of Small Sewerage Systems and Treatment Plants," led by William A. Ryan, Consulting Chemist of Rochester. The following topics were dis-

(Continued on page 53)

Need Special Information? Use this Readers Service

TO HELP YOU IN YOUR WORK, ANY OF THIS

INDUSTRIAL LITERATURE

WILL BE SENT **FREE** UPON REQUEST

It is a good practice to check this list regularly because descriptions of new bulletins are always being added. ★

Construction Materials and Equipment

Asphalt Heaters

8. A 32-page general catalog issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates their complete road maintenance line, including tar and asphalt kettles, surface heaters, oil burners, sand dryers, tool boxes, lead and compound furnaces, tool heaters, asphalt tools, joint and crack fillers, squeegee carts, etc.

9. Illustrated manual No. 11 describes "Hotstuff," the master oil burning heater. The only heater with patented elevated melting chamber for Asphalt, Tar and all bitumens used in road and street construction and maintenance, roofing, water proofing, pipe coating, etc. Mohawk Asphalt Heater Co., 94 Weaver St., Schenectady, N. Y.

Asphalt Mixing Plants

10. Precise engineering control of bituminous pavement construction is provided at low initial cost by the new Blaw-Knox (Madsen) portable asphalt mixing plant which is described and illustrated in a new catalog just issued by Blaw-Knox Company, 2019 Farmers Bank Building, Pittsburgh, Pa.

Asphalt Plants

11. A very complete 24 page booklet covering all five sizes and types of Iroquois Asphalt Mixing Plants which are particularly adapted to meet the needs of municipalities and contractors, providing maximum output at minimum cost. Barber Asphalt Co., 1600 Arch St., Philadelphia, Pa.

Bituminus Paving Machines

25. 32 Miles of Bituminous Roads in 256 Machine Hours and similar feats are described in a 16 page booklet (No. BPF) on Bituminous Road Construction with the Barber-Greene Bituminous Paver and Finisher, issued by the Barber-Greene Co., 635 West Park Ave., Aurora, Ill.

Concrete Accelerators

30. "How to Cure Concrete," a forty-seven page manual published by the Dow Chemical Company, Midland, Michigan, treats fully subjects suggested by title.

31. "Curing Concrete Roads with Solvay Calcium Chloride," 30 page booklet. Comprehensive. Contains tables, illustrations, suggestions for testing devices. Covers the subject in considerable detail. Solvay Sales Corp., 61 Broadway, N. Y. C.

35. "A report on Current Practice of using Calcium Chloride for curing Concrete Pavements, Bridges, Culverts and Concrete Products." It includes reports from the Highway Research Board, the Bureau of Public Roads and State Highway Departments. Columbia Products Co., Barberton, Ohio.

Concrete Mixer

44. Concrete Mixers, both Tilting and Non-Tilting types, from 3½s to 84s size, The Jaeger Machine Company, Columbus, Ohio.

Crushers

57. Up-to-date information on Stone Crushers, Stone Spreaders, Unloaders, Drags and other contractors' equipment from the Gallon Iron Works & Mfg. Co., E. Jeffry, Mfg. Co., Columbus, Ohio.

Culverts

60. "In diameters up to 10 feet and larger . . ." just issued by the Armco Culvert Mfrs. Assn., tells a good deal about drainage problems and their solution. 32 pages about drainage and multi-plate culverts.

Graders

76. Latest information about Gallon Motor Patrol Graders, Road Maintainers and Leaning Wheel Graders with hydraulic control is contained in a new series of illustrated catalogs, Nos. 125, 130, 135 just issued by the Gallon Iron Works & Mfg. Co., care of The Jeffrey Mfg. Co., Columbus, Ohio.

77. The new "Speed Patrol," so named because of its ability to speed up maintenance work, is illustrated and described in two new booklets just issued by the Tractor Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Hose and Belting

87. Complete information on rubber hose and belting for all types of contracting and road building service. The Government Sales Department of the Goodyear Tire & Rubber Co., Inc., Akron, Ohio.

Joint Filler and Line Marker

88. Bulletin No. G-9 issued by Littleford Bros., 452 E. Pearl St. Cincinnati, Ohio, describes and illustrates their new No. 91 Joint Filler which is used to fill horizontal and center joints with hot asphalt. It can be equipped to apply an asphaltic center line as it fills the center joint. This bulletin also describes the Littleford Traffic Line Marker.

Joint Filling Pot

89. A supplement to Bulletin No. E-5 has been issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describing their cone-shaped crack filling pot No. 86-B. The chief feature of this pot is that it is springless—there is no mechanism to get out of order. It is used to fill cracks and joints in concrete pavements and interstices in brick or granite block pavements.

Loaders and Unloaders

97. Portable Loaders and Unloaders. Folders: Nos. 1248, 1298 and 1074 cover Belt Conveyors with channel iron and truss types of framework; No. 1076, Portable Bucket elevators for different classes of work; and No. 1256, the "Grizzly" Crawler Loader for heavy work and large capacities. Link-Belt Company, Philadelphia

100. Materials Handling and Positive Power Transmission Equipment, giving technical data, list prices and illustrations of this machinery. Link-Belt Co., Chicago, Ill. General Catalog No. 500.

Motor Trucks

105. A new line of heavy duty motor trucks and tractors for dump and commercial hauling is described in literature recently issued by the Sterling Motor Truck Co., Milwaukee, Wis.

Paving Materials

109. A 36-page booklet with 66 illustrations has just been issued by the Barrett Co., giving full information regarding the making, laying and maintaining of "Tarvia-lithic," the ready-to-lay pavement.

111. "Tarvia Double Seal Pavements." Shows, step by step, the construction of a Tarvia pavement. 24 pages. The Barrett Company, 40 Rector Street, New York.

112. Complete directions for surface Cut Back Asphalt are contained in a 36 treatment and bituminous surfacing with page data book. Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.

113. Complete and detailed specification sheets on Road Oil and Penetration Asphalts, furnished on request by the MacMillan Petroleum Corp., El Dorado, Arkansas.

114. Complete information concerning Alabama Asphaltic Limestone will be sent promptly on request to the Alabama Asphaltic Limestone Co., Liberty National Bldg., Birmingham, Ala.

Road Machinery

127. "Road Machinery Illustrated." New illustrated bulletins on the motor rollers, three-wheel and tandem rollers, motor graders powered by Caterpillar, Twin City, Cletrac, McCormick-Deering and Fordson tractors, and straight and leaning wheel graders. Gallon Iron Works & Mfg. Co., Gallon, O.

★ MAIL THIS COUPON FOR INDUSTRIAL LITERATURE

7-33

Readers Service Dept.
PUBLIC WORKS
310 EAST 45th ST., NEW YORK

Please send me without obligation the following booklets listed in your INDUSTRIAL LITERATURE SECTION .....
(INDICATE BY NUMBERS)

.....

Name .....

Occupation .....

Street .....

City ..... State .....

Need Special Information? Use this Readers Service

Rollers

132. A 32-page book in four colors featuring a complete line of road rollers. 8¾ x 11, leatherette cover, numerous action pictures. Buffalo-Springfield Roller Co. of Springfield, Ohio.

133. 20-page pocket size booklet showing all types of Buffalo-Springfield motor rollers and scarifiers and their uses.

134. "The Chief," a six cylinder roller of advanced design and construction is fully described in an illustrated catalog just issued by the Galion Iron Works & Mfg. Co., care of The Jeffrey Mfg. Co., Columbus, Ohio. Gives complete details of the very latest development by this company.

Sand and Gravel Washing Plants

140. Seventy-page catalog giving complete information regarding Sand and Gravel Washing Plants, stationary and portable. Those interested in such equipment should have a copy. Link-Belt Co., Chicago, Ill.

Shovels, Cranes and Excavators

144. Complete information including operating ranges of General Excavators is given in Bulletin No. 3210 recently prepared by The General Excavator Co., 365 Rose St., Marion, Ohio.

146. Link-Belt Co., Chicago, Ill., has issued Book No. 1095, which describes and illustrates their complete line of Gasoline, Electric, or Diesel operated shovels, cranes and draglines. 910 S. Mich. Ave.

Steel Posts

160. Steel Posts for highway guard rails, fences and other purposes. Catalog and data book. Sweet's Steel Company, Williamsport Pa.

Surveying Instruments

163. A complete catalog and instruction book pertaining to the "Sterling" transits and levels are described and illustrated in a 64-page booklet. Warren-Knight Co., 136 No. 12th St., Philadelphia, Pa.

Tires, Truck and Tractor

165. Speed and economy in use of solid, cushion and pneumatic tires and tubes for trucks, cars, tractors, graders and other road machinery. Government Sales Department of the Goodyear Tire & Rubber Company, Inc., Akron, Ohio.

Tool Boxes

167. Bulletin No. G-6 issued by Littleford Bros. 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates the Han-DeeBox, a portable tool box of all-steel construction. This tool box is equipped with a special locking device that locks both covers at the same time. No padlocks are used. Littleford trailers, lead melting furnaces, and "Hot Dope" Kettles for pipe coating are also described in this bulletin.

Tractors

170. Everything you want to know about the Model L Allis-Chalmers Tractor is contained in a new 30 page illustrated booklet issued by the Tractor Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Road and Street Maintenance

Asphalt Heaters

8. A 32-page general catalog issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates their complete road maintenance line, including tar and asphalt kettles, surface heaters, oil burners, sand dryers, tool boxes, lead and compound furnaces, tool heaters, asphalt tools, joint and crack fillers, squeegee carts, etc.

Asphalt Mixing Plants

10. Precise engineering control of bituminous pavement construction is provided at low initial cost by the new Blaw-Knox (Madsen) portable asphalt mixing plant which is described and illustrated in a new catalog just issued by Blaw-Knox Company, 2019 Farmers Bank Building, Pittsburgh, Pa.

200. For general construction and maintenance, the Original Improved "Hotstuf" Asphalt Heater, an economical oil burning heater. Mohawk Asphalt Heater Co., 56 Weaver St., Schenectady, N. Y.

Bituminous Material Handling

201. "Handling Bituminous Road Materials." This is a new and valuable booklet covering handling and heating of bituminous materials for low cost road construction and maintenance. Full data regarding Cleaver-Brooks equipment. Cleaver-Brooks Co., 740 North Plankinton Ave., Milwaukee, Wis.

Distributors

206. Kinney distributors of from 600 to 1,700 gallon tank capacity with heating system and the Kinney jacketed pump having a capacity of over 400 gallons per minute are described in a new catalog just published by the Kinney Mfg. Co., 3529 Washington St., Boston, Mass.

208. "Important Message for Those Road Builders Who Want More for Their Money," a new folder on low-cost roads, and three illustrated bulletins covering their line of asphalt, tar and oil distributors will be sent promptly by E. D. Etnyre & Co., Oregon, Ill.

Dust Control

210. "How to Maintain Roads," by the Dow Chemical Company, Midland, Michigan, is a manual dealing thoroughly with dust control, road building and maintenance.

211. "Dust Control," a concise, handy pocket reference on control of dust by use of 3C Calcium Chloride. Illustrated. Issued by the Columbia Products Company, Barberton, Ohio.

212. "Wyandotte Calcium Chloride Prevents Dust the Natural Way,"—a publication, fully illustrated, treating on Dust Control, economical road maintenance and methods of application, issued by the Michigan Alkali Company, 10 E. 40th St., New York City.

Dust Laying

213. Full information regarding the use of Solvay Calcium Chloride for effectively laying dust. The booklet, "Solvay Calcium Chloride, a Natural Dust Layer," 24 pages, 5½x8, covers application, economies, etc. Sent without cost. Solvay Sales Corporation, New York.

Emulsion Sprayers

214.—A complete line of emulsion sprayers is described in Bulletin No. G-5 recently issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio. Littleford Emulsion Sprayers will spray any type of asphalt emulsion used for penetration patch work or curing concrete. They are also used to spray silicate of soda and weed exterminators.

Surface Heaters

220. The "Hotstuf" three in one, combination Tool, Asphalt and Surface heater is described and its use illustrated in Bulletin 16. Mohawk Asphalt Heater Co., 56 Weaver St., Schenectady, N. Y.

Road and Paving Materials

Bituminous Materials

113. Complete and detailed specification sheets on Road Oil and Penetration Asphalts, furnished on request by the Macmillan Petroleum Corp., El Dorado, Arkansas.

225. "Enduring Pavements and the Evidence." Everyone should have this data book on the use of lake asphalts. Contains 33 illustrations and list of streets and highways in this country paved with Natural Lake Asphalts. Gives yardages and days laid. Issued by the Barber Asphalt Co., 600 Arch St., Philadelphia, Pa.

226. Full details concerning the uses and advantages of Lincolnite Pulverized Petroleum Asphalt, Linco Road Oils, Cutback Asphalt Cement and Penetration Asphalt Cements will be sent free on request by Lincoln Oil Refining Co., Box 251, Robinson, Ill.

227. "Asphalt for Every Purpose, a 44-page illustrated booklet describing Stanolind Asphalt products. Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.

228. A new booklet has just been issued by The Barrett Co., 40 Rector St., New York, describing and illustrating the uses of each grade of Tarvia and Tarvialithic. 33 excellent illustrations.

229. A new series of concise and authoritative manuals of construction covering the latest developments in road-mix and surface treatment types as well as the standard asphalt pavements. These contain the best that has been developed by study, research and practical application in all types. Manual 1—Road-Mix Types is now ready for distribution. The Asphalt Institute, 801 Second Ave., New York, N. Y.

229A. Surface Treatment Types, Asphalt Road Construction Manual No. 2. Full details on surface treatments. 14 chapters, 128 pages. The second of those tremendously valuable and handy little manuals put out by the Asphalt Institute, 801 Second Avenue, N. Y. Sent on request.

Brick, Paving

230. Full information and data regarding the use of vitrified brick as a paving material, cost, method of laying, life, etc. National Paving Brick Manufacturers' Association, National Press Building, Washington, D. C.

Concrete Curing

235. "How to Cure Concrete," is a manual of instruction on the curing of concrete pavements. 47 pages. The Dow Chemical Company, Midland, Mich.

Gutters

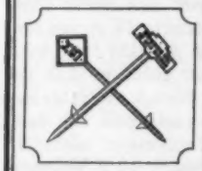
240. "Brick gutters and Parking Strips." A study dealing with the problems faced in the proper construction of gutters and how they can be overcome. Covers design, construction and results. Well illustrated. Just issued by the National Paving Brick Ass'n, National Press Building, Washington, D. C.

Jacking Culverts

260. No interruption to traffic, and substantial savings in construction costs are the main advantages secured by using the Armco jacking method to install conduits, drainage openings, and passageways under streets, highways and railroads. "The Armco Jacking Method," describing this modern means of construction and its many applications, will be sent upon request, by Armco Culvert Mfrs. Association, Middletown, Ohio. Ask for Catalog No. 7.

Maintenance Materials and Methods

270. "How to Maintain Roads," by the Dow Chemical Company, Midland, Michigan, is a manual dealing thoroughly with road building, maintenance and dust control.



Sweet's Steel Co.
Williamsport Penna.

SWEET'S
You can't use stronger, more durable or better weather resisting steel posts for your fence requirements than Sweet's Steel Posts—
STEEL POSTS

Write for Descriptive Folder

cussed: "Separate Sludge Digestion," Arthur Cary, Fairport; "Foaming Troubles and Their Correction," Harold Deming, East Rochester; "Embellishment of Plant Grounds," William Eckhart, Rochester; "Covered Sludge Drying Beds and Sludge Drying," A. W. Evans, Tonawanda; "Importance of Cleanliness About the Plant," A. H. Hale, Town of Brighton; "Prechlorination," John C. Strowbridge, Dundee, and "System in Operation and Operating Records," which was assigned to John Nelson of the Woodlawn District, Hamburg, N. Y., and in his absence briefly discussed by Mr. E. R. Cotton.

The afternoon session closed with a very timely paper by John Lewis, Director, Bureau of Maintenance & Operation, Department of Public Works, Rochester, on "The Selection and Maintenance of Mechanical Sewage Equipment." Throughout the meeting a lively discussion followed each paper.

On Saturday following the so-called "Sunrise Breakfast" a lively question box and Round Table discussion was conducted by Morris Cohn of Schenectady. The session closed with two papers describing the plants to be visited, one by Glenn D. Holmes, Consulting Engineer of Syracuse, on "Features of the Revamped Plant at Newark," and the other by R. G. McDonald, Engineer of the Village of East Rochester, on "Operating Experiences at the East Rochester Plant," each of which was briefly discussed.

The afternoon was devoted to an inspection trip by bus and private automobile to the East Rochester plant and the Newark plant, where many involved bits of design and operation were observed.

The next meeting of the Association will be held in White Plains in October at a date to be fixed later.

New England Water Works Association

E. Sherman Chase of Metcalf & Eddy, Statler Bldg., Boston, Mass., has been nominated for president of the New England Water Works Association. Roger W. Estey, superintendent of the Danvers, Mass., water works received the nomination for vice-president, and George A. Sampson, of Weston & Sampson, 14 Beacon St., Boston, for director for three years. The president will serve one year and the vice-president two years.

News of the Engineering World

Personal Items—Books—Recent Developments

Personal Notes:

John J. Felsecker, widely known in the water softening field, has joined the staff of D. W. Harring & Co., water consultants, 3408 West Monroe St., Chicago, Ill.

Burns & McDonnell Engineering Co. have moved their offices from the I[illegible] state Building to more commodious q[illegible]ters at 107 West Linwood Boulevard, Kansas City, Mo.

Neil C. Hurley has been elected president of the Independent Pneumatic Tool Co., Chicago, Ill., instead of the Chicago Pneumatic Tool Co., as erroneously stated in our June issue.

A Book Worth While:

Vocational Guidance in Engineering Lines. Sponsored by the American Association of Engineers, 560 pages, 50 illustrations of outstanding engineering construction, 6 x 9, cloth, $2.50 single copies U. S. A. and Canada, $2.00 in bulk, postpaid. Copies obtainable either from the American Association of Engineers, 8 South Michigan Avenue, Chicago, Ill., or from the Mack Printing Co., Easton, Pa.

The book gives an authentic picture of the various branches of the profession of Engineering and its numerous specialties, tells of the various channels of advancement in the profession and of its financial rewards, and suggests the educational equipment and traits of character of the individual that are necessary to achieve success.

The book is designed to encourage the most suitable types of young men to enter the profession of Engineering, and to discourage the unsuitable types; to assist students to select the branch of Engineering to which they are best adapted; to furnish teachers of Engineering with a fund of information about the profession; and to provide examples of unusually fine engineering English.

Fifty-two American engineers of the highest standing have collaborated as authors and editors in producing this book. Among the authors are: Dr. G. M. Butler, Dean of Engineering, University of Arizona; Major General Lytle Brown, Chief of Engineers, U. S. Army; Dr. William Bowie, Chief, Division of Geodesy, U. S. Coast and Geodetic Survey; John F. Coleman, consulting engineer, New Orleans, La.; Dr. C. E. Grunsky, consulting engineer, San Francisco, California; Frederic R. Harris, Rear Admiral (Civil Engineer Corps), U. S. N., retired; Dr. Charles F. Kettering, Vice-President, General Motors Corporation; Prof. Alexander Klemin, Director, Guggenheim School of Aeronautics, New York University; Dr. L. F. Loree, President, Delaware and Hudson Railroad; Dr. M. M. O'Shaughnessy, City Engineer, San Francisco, California; Dr. Robert Ridgway, Consulting Engineer, Board of Transportation, City of New York; Dr. William E. Wickenden, President, Case School of Applied Science, Cleveland, Ohio; and Dr. J. A. L. Waddell, consulting bridge engineer, author, and Chairman of the Editorial Committee for this book.

News from the Manufacturers:

Chain Belt Co., Milwaukee, Wis., has appointed the Superior United Corporation as distributors for the complete line of Rex Chain Belt equipment in the Chicago district and the state of Indiana.

The Syracuse Road Machinery Co. of Syracuse, N. Y., has taken over the sale and manufacture of the GSC Hi-Speed gravel, sand, cinder and calcium chloride spreader. Production has already begun on new and improved models. This spreader has the advantage of easy attachment or detachment and a wide range of capacity. H. B. Miller is general manager of the new organization.

H. W. Clark Co., Mattoon, Ill., has brought out a fine 24-page booklet that presents water meter installations in a manner instructive to the experienced operator or the engineer. The manner of setting is illustrated in a number of different ways, with emphasis on the use of Clark water meter boxes and meter yokes. Well worth having ready at hand.

J. F. Bowman, vice-president of the Federal Motor Truck Co. says that May, 1933, was the best month for two years, and that the May increase marked the third successive month of better business.

A very interesting and informative booklet on Transite pipe has been released by the Johns-Manville Co., N. Y. This pipe is composed of asbestos fibre and portland cement, combined under pressure, and is produced for working heads up to 500 feet, or pressures of 217 pounds. Further information on this pipe will be given later.

Coppus Engineering Corporation, Worcester, Mass., has announced the appointment of Blower Application Co., 918 North Fourth St., Milwaukee, to handle its line of Annis Industrial and Ventilating Filters, in the state of Wisconsin, excluding Florence and Marinette counties.

Road Maintenance with FWD Trucks and Cutting Costs with FWD Maintainers, two pocket size booklets published by the Four Wheel Drive Auto Co., Clintonville, Wisc.

To meet the increasing demand for all-purpose crawler-equipped hauling units Trackson Company, Milwaukee, Wis., announce the addition of 3-way crawler dump wagons with 7-10½ cu. yd. capacity to their dirt hauling wagons. At the present time the Trackson Company manufacture two sizes of bottom dump wagons, one size 3-way dump wagon and two sizes of crawler wheels.

Index to Advertisements

Alvord, Burdick & Howson	47	Frink, Mfr., Carl	33	Paulette & Wilson Engr. Co.	48
Ambursen Constr. Co.	47	Fuller & Everett	47	Pearse, Greely & Hansen	48
Atlas Mineral Prod. Co.	28	Fuller & McClintock	47	Pennsylvania Salt Mfg. Co.	23
Armco Culvert Mfrs. Assn.	3			Piccadilly Hotel	28
Austin-Western Road Mach. Co.	6	General Excavator Co.	33	Pirnie, Malcolm	48
		Green Co., Howard R.	47	Plankinton Hotel	28
Babcock Brothers	47	Harrub Engineering Co., C. N.	48	Potter, Alexander	48
Barrett Co., The	Front Cover				
Barstow & McCurdy	47	Hill, Nicholas S., Jr.	48	Quinn Wire & Iron Works	28
Black & Veatch	47	Hitchings & Co.	40		
Browne, Floyd G.	47			Roberts Filter Mfg. Co.	40
Buffalo-Springfield Roller Co.	33	Innis-Speiden & Co.	26		
Burns & McDonnell Eng. Co.	47	Industrial Chemical Sales Corp.	24	Shevlin Engineering Co.	48
				Simplex Valve & Meter Co.	48
Caird, James M.	47	Jaeger Machine Co.	40	Solvay Sales Corp.	8
Calcium-Chloride Assn.	8			South Bend Foundry Co.	28
Carter Hotel	33	Link-Belt Co.	46	Standard Oil Co. (Ind.)	4 & 5
Cleveland, H. Burdett	47			Standard Oil Co. of N. Y.	6
Columbia Alkali Co.	8	Macmillan Petroleum Corp.	33	Sterling Engine Co.	26
Cramer, Robert	47	Mathieson Alkali Works, Inc.	2	Sweets Steel Co.	52
		Metcalf & Eddy	48		
Dow, A. W.	47	Michigan Alkali Co.	8	Taylor, Henry W.	48
Dow Chemical Co.	8	Mohawk Asphalt Heater Co.	33	Texas Co.	Back Cover
		Municipal Sanitary Ser. Corp.	41		
Elrod, Henry E.	47			Warren Knight Co.	6
		Oliver United Filters Inc.	55	West Steel Casting Co.	28
Filtration Equipment Co.	38			Wiedeman & Singleton	48
		Pacific Flush Tank Co.	40		

275. "Tarvia-K. P. for Cold Patching." An instructive booklet illustrating and describing each step in patching a road with "Tarvia-K. P." 16 pages, illustrated, 3½x9. The Barrett Company, New York.

276. "Road Maintenance with Tarvia." A 56-page illustrated booklet of value to every road man. Shows how almost every type of road and pavement can be repaired and maintained with Tarvia. The Barrett Company, New York.

Snow Removal

Snow Fences

345. "Standard and Heavy Duty Reversible Blade Snow Plows for Motor Trucks," a new bulletin just published by the Monarch Mfg. Co., East Front St., Wilmington, Del. Illustrated. Contains complete descriptions and specifications.

349. "The Answer to the Snow Removal Problem." It gives full details of the Frink type S snow plow for trucks. Carl Frink, Mfr. of Clayton, N. Y.

359. Gallon Iron Works and Mfg. Co., Gallon, Ohio. Details, prices and catalogs of their snow plows adaptable to any make of truck.

Sanitary Engineering

Activated Carbon, Aqua NUCHAR

380. For low cost removal of tastes and odors from potable waters. Used by more than 400 municipalities. For literature address Industrial Chemical Sales Company, Inc., 230 Park Avenue, New York.

381. Proportioneer's Inc., 737 N. Michigan Ave., Chicago, describe in an 8 page folder their mechanical devices for controlling accurately and automatically the flow of fluids used for treatment of water supply and sewage. Ferr-O-Feeder —diaphragm pump for Ferric-Chloride or other corrosive fluids; Chlor-O-Feeder for Hypochlorate solutions. Write for a free copy.

Ferric Chloride

382. Full information concerning the experiences in the use of ferric chloride for use in sludge conditioning and in coagulating sewage will be sent promptly by Innis, Speiden & Co., 117 Liberty St., New York, N. Y.

383. Loughlin Clarifying Tanks for the more complete removal of suspended solids from sewage and industrial wastes at lower cost are described in a new bulletin just issued by Filtration Equipment Co., 350 Madison Ave., New York, N. Y.

Sludge Drying

385. Relatively dry cake sludge in demand for fertilizer is produced by automatic continuous vacuum filters like those used in Milwaukee, Houston, Chicago, Gastonia, N. C., Charlotte, N. C. Write for literature. Oliver United Filters Inc., 33 West 42nd St., New York, N. Y.

Jointing Materials

401. G-K Compound for vitrified clay sewers, MINERALEAD for bell and spigot water mains, also M-D Cut-Ins for making house connections. Atlas Mineral Products Company, Mertztown, Pennsylvania.

402. Full details concerning No. 1 Korite for sealing sewer pipe joints so that they will be permanently tight. Standard Oil Co. of Indiana, 910 So Michigan Ave., Chicago, Ill.

Manhole Covers and Inlets

404. Street, sewer and water castings made of wear-resisting chilled iron in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., South Bend, Ind.

Meters, Sewage and Water

405. Just issued. Every sanitary engineer should have a copy of this new 32 page booklet describing the applications, types and distinctive features of the new Bailey meters for sewage treatment and water supply. Sent promptly. Bailey Meter Co., 1027 Ivanhoe Road, Cleveland, Ohio.

Pumping Engines

413. "When Power Is Down," gives recommendations of models for standby services for all power requirements. Sterling Engine Company, Buffalo, N. Y.

Screens, Sewage

417. The simple, automatic, Loughlin self-cleaning traveling screen is fully described in a new bulletin just issued by Filtration Equipment Co., 350 Madison Ave., New York, N. Y.

418. Sewage screens (Tark, Brunotte, and Straightline) for fine and coarse sewage; Straightline Collectors for Settling Tanks (Sludge, Scum and Grit), and Mechanical Aerators for activated sludge plants. Link Belt Company, 910 So. Michigan Ave., Chicago, Ill. Book 642.

419. An illustrated booklet showing installations, and complete details regarding the 19 exclusive improvements which are featured in Shevlin Fine Disc Screens will be sent promptly by the Shevlin Engineering Co., Inc., 227 Fulton St., New York, N. Y.

420. A useful new bulletin for all those interested in sewage disposal, describing some of their proven equipment such as self-cleaning bar screens, grit conveyors, sludge collectors and shredders, has just been issued by the Jeffrey Mfg. Co., Columbus, Ohio. Includes diagrams and many illustrations.

Screens

424. Water Screen Book No. 1252, describes water screens and gives complete technical information about them. Link-Belt Co., Chicago, Ill.

Sludge Bed Glass Covers

426. Sludge Bed Glass Covers—"Super-Frame" Hitchings & Co., Main Office, Elizabeth, New Jersey. Offer A. I. A. File 101SB, describing glass covers for sludge and sprinkler beds; details, specifications and cost data.

Sludge Conditioning

381. Full information concerning the experiences in the use of ferric chloride for use in sludge conditioning and in coagulating sewage will be sent promptly by Innis, Speiden & Co., 117 Liberty St., New York, N. Y.

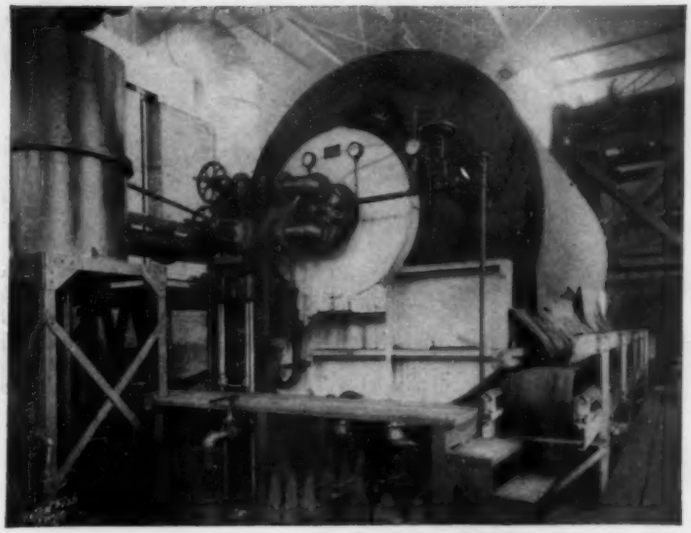
Treatment

429. A new series of bulletins describing their full line of sewage treatment equipment—Fine Screens, Schofield Bar Screens, Vacuum Filters for Sewage Sludge, Decarie Screenings Incinerators, Schofield Bar and Fine Screens, Vacuum Filters for Sewage Filtration and Pneumatic Ejectors for Sewage Screenings—are ready for distribution on request to Municipal Sanitary Service Corp., Room 2703, 155 East 44th St., New York, N. Y.

430. Separate bulletins showing their many lines of sewage treatment equipment will be sent promptly by The Pacific Flush Tank Co., Chicago and New York. The latest is No. 110 describing tray clarifiers.

431. Eliminate sludge bed troubles, forget about weather conditions, odor nuisance, hail insurance and the like. Full details as to how Oliver United Vacuum Filters overcomes these problems will be sent to all interested by Oliver United Filters Inc., 33 West 42nd St., New York, N. Y.

433. Collectors and concentrators for modern sewage treatment plants, recent installations, and full data on aerators, and screens. Link Belt Co., 910 So. Michigan Ave., Chicago, Ill. and Philadelphia.



A 11.5 ft. by 16 ft. Oliver Continuous Filter dewatering sewage sludge in the Chicago West Side plant.

Your Best Bet for Dewatering

raw sludge
Imhoff sludge
activated sludge
mixed raw and activated sludge
digested primary sludge
chemically precipitated sludge
water softening sludge

Weather Conditions *do not affect* Oliver Results

Oliver United Sludge Filter

You save money—a good deal—in first costs. Your per ton costs for dry sludge compare favorably with those from open sand bed dewatering. Your handling is much simpler.

But—and in some ways these are better yet—you won't have large unsightly areas nor will there be objectionable odors going down wind. You won't require excess storage facilities or hail insurance.

Other communities are benefiting from the operation of Oliver United Continuous Sludge filtration. Make similar plans for your sewage plant. Our sanitary department is at your service in drawing up these plans.

OLIVER UNITED FILTERS INC.

NEW YORK
33 West 42nd Street
SAN FRANCISCO
351 California Street

CHICAGO
221 North La Salle Street
TORONTO
330 Bay Street

Affiliated with the Dorrco—Engineers

Gang of men covering an application of Texaco Asphalt Surfacing Material.

Another gang of workmen laying a Texaco Asphaltic Concrete pavement.

PRODUCTIVE UNEMPLOYMENT RELIEF

These men are engaged in patching holes in a street, using Texaco Cold Patch.

Covering an old pavement with a new surface of Texaco Sheet Asphalt.

Too often, unemployment relief does not produce results of value to the community. Road and street maintenance and construction with TEXACO Asphalt products not only provide work for many, but the results obtained are truly valuable.

Hot or cold-patching of streets and roads, the construction of low-cost TEXACO Asphalt surfaces or the laying of hard-surface TEXACO Asphalt paving all give substantial unemployment relief. But, more than that, they lower automobile upkeep, increase real estate values and improve the general appearance and attractiveness of a community.

Kill two birds with one stone by relieving unemployment and advancing your road and street program this year with TEXACO. Booklets on Sheet Asphalt paving, Asphaltic Concrete paving, Resurfacing Old Pavements, Low-Cost Surfaces, Cold Patching and Brick Filler will be sent on request to those interested.

TEXACO

ASPHALT CEMENTS
CUT-BACK ASPHALTS
EMULSIFIED ASPHALTS

Chicago
Cleveland
Kansas City
Houston
Dallas
Buffalo

The Texas Company
ASPHALT SALES DEPT.
135 East 42nd St., New York City

New York
Philadelphia
Richmond
Boston
Jacksonville